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BY MARTIN DOYLE,

AUTHOR OF "HINTS TO SMALL FARMERS," "PRACTICAL GARDENING," ETC.

WITH ILLUSTRATIONS ENGRAVED ON WOOD.

DUBLIN
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TO THE

MOST HONORABLE THE MARQUESS OF DOWNSHIRE.

My Lord Marquess,

To the many instances of condescending kindness which, on various occasions, and in different modes, I have had the honour of experiencing from your Lordship, I have now to add the obliging readiness with which I am permitted to consign this Volume to your Lordship's distinguished patronage.

It is not, however, with the foolish expectation that this compilation of matters familiar to your Lordship, will derive any permanent character of usefulness from the mere authority of your name—as this must and ought to depend on the intrinsic merits of the work itself—no; I have solicited permission to connect it with the name of a nobleman whose good management of his extensive possessions has attracted so much public observation, in order to avail myself of so fitting an opportunity of expressing my individual respect for your Lordship's character, as well as to infuse into the body of our landed proprietors in general, some portion of that praiseworthy solicitude and zeal in the cause of agricultural improvement, by which your Lordship's exertions have been so honorably signalized.

It is well known that your Lordship has recently visited Belgium, in company with one of your able and intelligent agents, with a view to the introduction into Ireland of the modes and habits practised by the proverbially expert and comfortable husbandmen of that country. I can conceive nothing more likely to prove eminently useful than such means of supplying to our *land agents* experimental knowledge of a system in every respect so preferable to that slovenly one which has prevailed in Ireland.

That cases such as those I have now briefly sought to point out for imitation, may long continue to occupy your Lordship's patriotic and enlightened thoughts, is the unaffected wish of an humble farmer, who knows your worth, and therefore is proud to declare himself, with all becoming respect and gratitude,

Your Lordship's most faithful and obedient Servant,

MARTIN DOYLE.

Ballyorley, September, 1839.

ADVERTISEMENT.

In the following work it has been the Author's chief design to present those interested in agricultural matters with the very best information on the various subjects connected with their pursuit. A work of this nature is evidently one of much labour and difficulty; for the mass of information accumulated by various original writers, as well as compilers, must not only be carefully selected and arranged, but so condensed as to bring all essential points into view, without, on the one hand, incurring the imputation of prolixity, or, on the other, falling into that meagre conciseness, which baffles the inquirer.

There is, therefore, no part of the work which has not occupied much of the compiler's best care and assiduity. It has been his constant aim to cull the essential and scattered matter of all, that, in his judgment, appeared genuine and excellent in quality. For this purpose he has consulted the best periodical and standard agricultural works of the day, occasionally adding such useful observations as his own practical experience suggested; while, at the same time, he has endeavoured to lead the attention of the reader, incidentally, or by direct reference to those valuable sources, whence he may derive information in more copious stores, and conveyed in happier style.

He may add, that there is no disputable point discussed in these pages, on which he has not consulted the best authorities, oral or printed; nor has he offered any opinion of his own which is not sanctioned by a long course of habitual observation, grafted on actual experience.

It is evident, that the nature of the work precludes all claim to originality; if, however, an humble and plainly educated man may pretend to a careful selection, and commodious arrangement of details, the compiler is willing to hope he has not deserved ill at the hands of the farming world; at all events, he flatters himself it will be granted that he has studiously avoided the insertion of unnecessary, or mere expletive matter; and that, where he has hazarded his own suggestions, he has done so without dogmatizing, or arrogating to himself hints which exclusively belong to others.

It is in this spirit and feeling he now takes leave to request that those of the discerning public who may honour his pages with their perusal, and who are sufficiently practised in rural management to do so, will confer upon him, individually, the kindness of confiding to his publishers in Dublin, such hints and emendations as may appear to them likely to enhance the value of any future editions which the farming world may call for.

PRACTICAL HUSBANDRY.

AGRICULTURE—The art of preparing the earth for the production of vegetables. This definition, strictly speaking, includes Horticulture, but custom has confined the application of the term to field-husbandry.

The earliest records of the human race inform us, that agriculture has been practised, with more or less skill, from the time when "the Lord God took the man and put him into the Garden of Eden to dress it and keep it." The Holy Scriptures make frequent allusions to the practice of this most important art, and the general history of nations supplies innumerable instances of individuals who have contributed either by their personal labour or their writings in different ages to the advancement of agriculture. In the history of Rome especially, many interesting anecdotes have been preserved of heroic generals, who, in the intervals of peace, have deemed it not degrading to their rank, to pursue the avocations of the husbandman, and who have found their most pleasing recreations in the labours of the farm; and volumes of prose and verse from the classic authors of ancient Rome attest the industry and taste which prevailed among her sons. The highest honours were awarded to those who introduced or taught the best mode of tilling the soil, and even philosophers, ancient and modern, have given the sanction of their authority to the dignity and importance of husbandry. Socrates designated Agriculture as "the nurse and mother of all the arts." Sully, one of the ablest statesmen of his time, has used the same illustration. Gibbon asserts that *Agriculture is the foundation of all manufactures,* since the productions of nature are the materials of art. Adam Smith observed with equal elegance and truth, that all riches are only nominal, except the precious fruits of the earth, which are real, and will be produced portion to the means adopted for their increase; and Swift says, who makes two blades of corn grow where only one grew ore, is a benefactor to mankind.

It would be impossible, and quite foreign from our present purpose, to enumerate the varieties of the vegetable creation which have been imported and gradually acclimated in our portion of European soil. Almost all our herbs, flowers, and fruits are of foreign extraction. Flax was first introduced from Egypt into France, which it greatly enriched. Artificial grasses, especially Lucerne, were of Asiatic origin; and as they became familiar to the farmers of Italy and her contiguous provinces, multiplied the number of cattle, and consequently increased the quantity of manures and the fertility of the soil. It would be curious and interesting to trace the advance from the rude plough, with a single stilt, to the best modern *Wilkie,* and to mark the gradual development of knowledge in the utility and application of manures; but practical details of our own husbandry in the present day are those to which this work will be limited. The following statements, however, which were made after the Britons retired into Wales, may be briefly noticed. "No man was allowed to guide a plough who could not make one, nor to drive one unless he could make the rope (of twisted willows) with which it was drawn." "If any person laid dung on a field, with the consent of the proprietor, he was allowed the use of that field for one year. If the dung was carried out in carts in great abundance, he was allowed to have the use of that land for three years; whoever cut down a wood and converted the ground into arable, with the consent of the owner, was to have the use of it for five years. If any person folded his cattle for one year upon a piece of ground belonging to another, with the owner's consent, the use of the field was allowed him for four years." The agriculture of England was advanced from its low condition by the introduction of French and Flemish husbandry, after the invasion of the Normans in 1066. The Norman clergy were agriculturists; and it is recorded of Thomas a Becket, that he and his monks went reaping; it would have been well for him if he had confined his labours to those of the sickle. Among other improvements, the Norman plough with two wheels, superseded the British one with a single stilt; and the driver of the oxen who, until that period, had walked backwards brandishing a cudgel before his terrified train, dragging the plough by ropes fastened to the tails, now walked, as nature intended, forwards. For a period of five hundred years subsequently, little is known of British husbandry. Sir A. Fitzherbert, Judge of the Common Pleas in 1534, turned his talents to the philosophy and practice of Agriculture, and published treatises on that subject, which, however defective they may now appear, stimulated to inquiry and emulation. The author of a Latin tract written at the end of the thirteenth century, "estimates the possible returns from the soil so low, as to inform us, that unless an acre of wheat yielded *three times the seed sown*, the farmer would be a loser, if corn was not unusually dear." This calculation is as follows:—

	£	s.	d.
Three ploughings	0	1	6
Harrowing	0	0	1
Two bushels of seed	0	1	0
Weeding	0	0	1½
Reaping	0	0	5
Carrying	0	0	1
	£0	3	2½

Which is about the value of six bushels of wheat at the time he wrote:* rent was then about 4d. per acre. In 1387 the price of a cow and her calf varied from six to ten shillings, and the produce of the milk of an ordinary one was valued at two pence three farthings per week. Ewes also were milked, and twenty of them if well kept were thought equal to three cows. In 1697 Donaldson printed his *Husbandry Anatomized*, and until that period the agriculture of Scotland was execrable, and unnoticed through the press. Plattes, Evelyn, Tull, (the father of drill husbandry, at the commencement of the 18th century,) Maxwell, Young, Sir John Sinclair, Kirwan, Sir Humphry Davy, Professor Low, and other eminent men, have successively communicated important information to their countrymen, and fostered and matured the spirit of successful enterprise, which has rendered Great Britain so pre-eminent as an agricultural country. Sir John Sinclair, has in an especial degree, merited the gratitude of his countrymen. This distinguished individual, who in 1793 founded the Board of Agriculture, of which he was the President for nearly half a century, devoted much of his private property, his varied talents, and untiring industry, to the interests of Agriculutre, to the advancement of which he has probably contributed more essential service, during his very protracted life, than any other person. The Agriculture of Ireland, compared with that of Great Britain, is even yet very defective. Until English and Scotch colonists succeeded to locations in Ireland, its products were chiefly cattle, and the small quantity of corn grown in this country was raised in the worst possible manner. The incorporation of the Royal Dublin Society in 1742, had some effect in promoting agricultural industry; but such was the deficiency of tillage in Ireland at that time, that among the first premiums offered by that society was the following, viz. "To the person who should break up the greatest quantity of lay ground, for any purpose of husbandry, the sum of £50, in plate!"

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* Introduction to the first volume of British Husbandry, published under the superintendence of the Society for the diffusion of Useful Knowledge.

It appears that there was an unrepealed statute, when Campbell wrote in 1775, enforcing the cultivation of not less than five acres out of each hundred, under the penalty of forty shillings: "but the act was as dead as the letters of it, for all the rich were delinquents." This writer gives a woeful picture of Munster at the period referred to—"for ten or twelve miles on this side of Kilkenny the soil was far from rich, it was indeed rather poor, yet it was pretty well cultivated, the fields were enclosed with hedges and ditches, and the country embellished with houses and plantations; but as the ground improves on approaching the borders of Munster, agriculture ceases, and not a house, not a hedge, not a ditch to be seen. The country is deserted by the human species, and peopled with sheep." The grant of bounties (which commenced in 1762) on the inland carriage of corn from all parts of that kingdom to the capital, was one of the means by which tillage became increased in Ireland, in consequence of which many of the most extensive mills in the world have been erected.

The progress of Irish agriculture since Young published his important tour in 1778, has been rapid and considerable, and at no remote period it is fair to presume the defective management which now characterises Irish agriculture will yield to a system, comparatively, if not positively, excellent. The *principles* of agriculture are every day becoming more determinate and better understood; the circulation of useful publications on the subject—those by the Society for the Diffusion of Useful Knowledge in particular—must exercise considerable influence, by exciting the farmer's mind to inquiry, and leading him to the adoption of rules established by his own actual experiments; and the results of increasing experience, collected for the general advantage, must gradually effect an alteration of practice, even among those who are most ignorant, and therefore unwilling to relinquish old and unprofitable customs. It is certain, that the great body of the Irish farmers in particular, are devoid of any knowledge whatever of husbandry as a science; they pursue, with very little deviation, the paths in which their fathers have trod before them, with the wise observation, that "nothing comes of new schemes." As education advances, prejudices against innovations of practice will give way to the conviction that agriculture, *like every other art*, will be beneficial in proportion to the degree of skill and knowledge with which it is pursued. It is far from our intention to recommend an eager pursuit of every new plan and speculation, which would soon terminate in ruin, but (according to means and circumstances) we would wish to see manifested a disposition to adopt whatever, by the fair experiments of others, has really succeeded. Men of judgment and information are usually cautious, but the ignorant are generally obstinate, in consequence of their ignorance, which prevents them from drawing any rational inferences. Scotch husbandry, until fifty or sixty years ago, was little if at all better than Irish agriculture, though now it occupies, in some Scotch counties, so prominent a rank, unequalled in any part of Ireland. Regarding the comparative merits of *Scotch* and *English* husbandry, Mr. Loch, M.P. for Sutherland, thus expresses himself—"The rapid success in improvement, so visible in certain districts in Scotland, has led rather too rapidly to the conclusion, not only that the Scotch are decidedly better farmers than their English brethren, but that the latter are in fact but indifferent husbandmen. Nothing can be so totally without foundation. That a considerable portion of England might be better farmed than it is, may be true; but it would be a matter of astonishment, in a country cultivated as this country is, from one end of it to the other, if much indifferent farming did not prevail. There is no country where so many valuable practices exist, many unknown to the agriculturists of the north, and well worthy of their consideration and adoption."

Comparing the agricultural circumstances of Great Britain and Ireland, Mr. O'Connell recently made the following statement—"There are in Ireland 75,000 more agricultural labourers than in England; the gross population of Ireland is much less than that of England, but the number of labourers is, as I have said, much greater. Ireland has a greater number of agricultural labourers than Great Britain, but has she a greater number of cultivated acres of land? far from it; in Great Britain there are 32,250,000 acres of cultivated land, in Ireland there are only 14,600,000. But the soil of Ireland is not sufficiently cultivated, and, therefore, notwithstanding its natural superiority, it is infinitely less productive than the soil of England. In Great Britain the produce of agriculture amounts in money, to £150,000,000 a year, whereas in Ireland it amounts only to £36,000,000. Thus it appears that, although the quantity of cultivated land is nearly one-half of the quantity cultivated in Great Britain, the value of the produce of the land cultivated in Ireland is less than one-fourth of the land cultivated in Great Britain. Whence does this arise? the soil of Ireland is notoriously more fertile than that of England. Why does it produce less? the cause is well known, it is the want of capital to lay out on the land, to make it as productive as it might be." If this be not strictly correct, it approaches very nearly to the truth, and fully demonstrates the inferiority of Irish agriculture.

The life of the husbandman ("oh, too happy husbandmen, if they were but sensible of their blessings") is assuredly more *enjoyable* than that of the mechanic, the clerk, or the shopkeeper, and incalculably less exposed to the contaminations of social guilt; he will experience his cares and anxieties, it is true, when unfavourable seasons or casualties occur, or the prices of produce are disproportioned to the cost of their production; but if a due variety of crops be cultivated—such as a judicious rotation requires—it will be found on calculation, that the abundance or high price of some, will compensate for the deficiency or cheapness of others, so that the balance on an average of any given number of years will be sufficiently favourable to the farmer, if his expectations be within reasonable limits. If his profits, compared with those in *trade*, on the same capital, be moderate in amount, he should bear in mind, that his liability to extreme fluctuations is less, and if this be true as a general observation, it follows as a fair deduction, that if farming were not undertaken, as is frequently the case, especially in Ireland, without theoretical knowledge, practical experience, and suitable capital, there would be still less cause for dissatisfaction with farming as a profitable occupation, and abundant evidences that *with* adequate skill and capital, the labours of *agriculture* would be more remunerative. "Instances are constantly recurring of men in easy circumstances who, without any knowledge of either the theory or practice of husbandry, engage in it merely for amusement, and not condescending to stoop to the details, are exposed to the numberless impositions of their tradesmen and servants; they pay higher wages, and obtain lower prices than their neighbours; they grow large crops, but at an expense that the sale will not repay; and retiring at length in disgust, they declare farming to be a losing concern, but without acknowledging that it only became so through their own improvidence."

AGRICULTURAL SCHOOLS—The general establishment of these is most desirable, especially in Ireland, where "the culture seems to be in an inverse ratio to the fertility of the soil."

The well-known school at Hofwyl, in Switzerland, superintended and supported by the benevolent Fellenberg, has produced the happiest results among the most destitute and outcast of the poor around him. This interesting establishment was visited in 1818 by the present Lord Brougham, whose exertions in the cause of education are beyond all praise; he published an account of his visit to Hofwyl, in the 64th number of the Edinburgh Review, to which we would refer our reader. In the Labourers' Friend Magazine, No. 56, there is a delightful account by a visitor of the appearance and circumstances of this school in 1832, extracted from John Hull's Philanthropic Repertory.

"In the month of August, 1832, I travelled into Switzerland for the purpose of making myself acquainted with the schools and institutions at Hofwyl. Situated about three leagues from the picturesque capital of Berne, amidst a beautiful scenery, composed of a cultivated vale, the Jura ridge of mountains, a pine forest, a small lake, and the glaciers of the Bernese Alps, stand the extensive buildings of the establishment, surrounded by about two hundred and fifty acres of farm land. Upon my first arrival, before I could obtain an opportunity of presenting my letters to the benevolent founder, I wandered about in various directions;—all was business and activity. Here was a troop of lads cutting the ripened corn, while another troop was engaged in conducting it to the barns. Here was the forge in activity; and there some little gardeners performing various operations in small plots of ground that were portioned out: here were a group of little girls gleaning; there, others carrying water—most of them singing while thus employed. But my attention was peculiarly arrested by about one hundered men, who, in a large open building, erected in a recess of the garden, appeared to be engaged like boys in a school-room; over the entrance was inscribed this motto:—'The Hope of their Country.'

"I was, at last, fortunate enough to be admitted into the study of M. de Fellenberg,—a man somewhat advanced in years, with a countenance beaming with intelligence and kindness. De Fellenberg was, by birth, one of the ancient aristocracy of the country, and in possession of the hereditary property of his family. He determined upon devoting his fortune, and the labour of a life, in the endeavour to effect the regeneration of his native land, by the means of education. 'I will infuse good habits and principles into the children,' said he, 'for, in twenty short years, these children will be the men, giving the tone and the manners to the nation.' For thirty-two years has he pursued his steady course, increasing in influence, and extending his establishment as his scheme grew upon him, until it has become what he described to me. 'This,' said he, pointing to a large building, 'is the Institute for the boys of the higher classes. Here are their dining-rooms; arranged on each side of yonder galleries are their dormitories. Here you see their gardens, their museum, their workshops, their school-rooms; here their gymnasium, where they exercise themselves in wet weather; here their stream of running water where they bathe every day—study is their employment—bodily labour their recreation—but bodily exertion I insist upon. There is no health, no vigour of mind, no virtue without it. Those persons grown to manhood, who are mixing with the boys, are placed by me to observe every action, and catch every expression. My grand object is to comprehend thoroughly the character of my pupils, in order that I may work more efficaciously upon them. These persons are by no means considered as spies by the boys; they are their companions. At Hofwyl, all that is not wrong is permitted. I never like to forbid a thing when I am unable to assign a reason for doing so: it creates a confusion in young minds with regard to principle, a thing most dangerous to their future happiness. We have no boundary mark—yet my boys stay at home—we interfere not with their pleasures, yet they cling to their duty.

"'Within this inclosure is my eldest daughter's poor-school for girls. She has about a hundred under her direction, who are fed and clothed by the establishment. To these she devotes her entire time. They learn all that in after-life will be of service to them:—to cultivate the garden; to sew; to make all these little necessaries which are of so much importance in the cottage; to read; to sing; to be cheerful and to be happy. UNLESS OUR WOMEN BE BROUGHT UP IN MODESTY, AND WITH INDUSTRIOUS AND RELIGIOUS HABITS, IT IS IN VAIN THAT WE EDUCATE THE MEN. IT IS THEY WHO KEEP THE CHARACTER OF MEN IN ITS PROPER ELEVATION.

"'Here is my school for the middling classes—here all instruction has reference to practical purposes. Man was born to have dominion over the earth, and to subdue it; but it is by the intellect alone he can do so. His unassisted strength—what is it? To conquer nature he must understand her. Look in here, and you will see the laboratory of the chemist, and the lever and the pulley of the mechanic.

"'In these two buildings are my poor-schools for boys, who are boarded and clothed by the establishment. And well they earn their maintenance; for the little fellows work ten[*] hours a day in the summer, and the expense that I incur in their behalf is nearly repaid by their exertions. They study for two hours each day, and this I consider sufficient. The case here is the reverse of the Institute; for bodily exertion is the labour, and study the recreation. The habits I bring them up with are those which I desire should continue with them through life; they, consequently, have reference to their probable position in society. The habit of continued study would ill become a person destined to gain his livelihood by his hands. Although there are now one hundred boys assembled here, mine were but small beginnings. I had but one pupil at first. It was long before I could find a master in whom I could confide. Do you observe those little patches of garden-ground? Each poor lad has one to himself, and the produce belongs exclusively to him. They usually dispose of it to the establishment, which either pays them the money at the time, or lodges it for them in a little bank I have founded. Many of them have very considerable sums there. It is here that they obtain a habit of passing the greater portion of their time in continued and patient labour; they become acquainted with the value of labour by the produce of their little gardens. The instructions that I give them, although somewhat more elevated than what is generally obtained by persons of their rank in life, is directed to the rendering perfect the senses and reflection,—to make them better practical men;—drawing, the sciences of arithmetic and geometry, a useful selection from the other sciences, all taught in the most unostentatious manner; the history of their native country, and an acquaintance with the different natural objects around them, together with music, form the extent of their literary instruction.

"'Religion is inculcated in every way. Public prayer, both at church and at school, is regularly performed, in common with the schools of other countries. Besides this, these poor lads are taught to see the Creator in his works. When their admiration is roused by a natural object, they are accustomed to direct their thoughts to its Maker.

"'But here,' said my venerable companion, 'is the engine upon which I rely for effecting the moral regeneration of my country (and my attention was directed to the men whom I had before seen in the morning); these are the masters of village schools, come here to imbibe my principles, and to perfect themselves in their duty.

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[*] I think ten hours' labour too much for the young. In the labour-schools of America, of which I have heard a good account from an eye-witness, the youths work only three hours per diem. J. H.

> These men have *six thousand* pupils under them; and if, by the blessing of God, I can continue the direction of them, success is certain.'
>
> "To ensure success, M. de Fellenberg spares no pains,—no expense. There are no less than thirty-two professors solely devoted to his establishment, who inhabit a house to themselves upon the premises.
>
> "In all, there are about three hundred and fifty individuals in this little colony. Despite of his enemies, the spirit of De Fellenberg is spreading throughout Switzerland; and after having seen the parent institution, I visited several of his establishments in some of the remotest cantons.
>
> "A week closed my sojourn at Hofwyl. I quitted it with a heavy heart; and the recollection of the moral beauty of what I there witnessed will remain rivetted on my memory for ever."

In Russia there has been for some time an Agricultural College, under the direct patronage of the king of that country; and now at Petersburgh and Moscow, there are similar institutions for teaching the art of agriculture, in theory and practice; and the Royal Academy of Agriculture near Frankfort-on-Oder, superintended by the scientific and practical M. Thaer, is celebrated on the continent.

In Ireland these seminaries are especially needed, for here there is not, as in England and Scotland, a class of farmers capable of teaching in their every-day operations, the principles and practice of improved husbandry, to pupils willing and able to pay liberally for the privilege of learning it; nor are male and female labourers to be had (from want of being shown how to do it) who can hoe a wheat or turnip crop,

In Ireland, however, the subject has been regarded with *some* practical results. An agricultural school was instituted in 1821 at Bannow, in the county of Wexford, of which an official report was published in 1826, by the late Rev. Richard Radcliff, the able Secretary of the *then* Agricultural Society for Ireland, which states:—

> "The farm consists of forty acres of impoverished soil and naturally unproductive, from under-water and other forbidding circumstances; it is, however, free from any charge of rent, and the only spot out of lease, which the liberal proprietor, Mr. Boyse, had in his power to give up to the establishment. Considering the shortness of the time, the improvement is considerable, much has been judiciously drained, and the whole well inclosed, and divided into square and equal fields, the old and irregular subdivisions having been effaced.
>
> "Exclusive of Mr. Hickey's anxious superintendence, the pupils are instructed by two masters; by one (who is an admirable teacher) in reading, writing, arithmetic in all its branches, mensuration, surveying, geometry, the mechanical powers, and the elements of chemistry, as relating to agriculture; he also lectures, from the most approved authors, upon the rotation of crops, and upon the management of the garden. The establishment cannot yet boast of the fertility of its fields, but may, with any other, dispute the cultivation of its pupils. It is fortunate in possessing a teacher of great perseverance and unusual capacity, by whom, for a con-

siderable time, in presence of the reporter, they were examined, and made prompt and intelligent answers in all the highest and most difficult branches of arithmetic, as well as in some other points of scientific knowledge connected with the study of agriculture.

"The second master, equally efficient in his department, and of peculiar steadiness, is a Scotch farmer, who conducts the outworks, and instructs the pupils practically in ploughing, sowing, reaping, and in all the various operations of the farm; should this farm, in process of time, come to be productive, it will reflect great credit on the skill and perseverance of the establishment and its conductors; where suitable buildings are already erected, much cost will be avoided, and where the soil is of productive quality, an immediate return may be expected—in the present instance neither of these favourable circumstances has occurred, and yet the undertaking prospers."

The promotion of the Rev. William Hickey to another parish, and the accumulating losses attendant on the education, clothing, and diet of boys, who, with few exceptions, were too young to be useful in the actual labours of the farm, and who paid but a nominal sum for their maintenance, rendered the dissolution of that seminary unavoidable, after an existence of only seven years.

A school, similar in object and principles, was founded at Templemoyle, in the county of Derry, and continues in active operation; the subjoined statement respecting it (contributed by one of the committee) appeared in the 51st number of the Irish Farmer's Magazine:—

"The agricultural seminary of Templemoyle originated at a very numerous meeting of the North-west of Ireland Farming Society at Londonderry, and it was at first, intended that it should consist of two establishments, taking Mons. Fellenberg's Institution at Hofwyl, in Switzerland, in some degree as the model: the first, to be a school affording instruction in every science and accomplishment aimed at by the children of the higher orders; the second, for the education of the sons of respectable farmers and tradesmen, in the hope of disseminating the advantages of an improved system of farming with greater certainty, by combining the practice and theory of it in the instruction of those who were afterwards to make agriculture their pursuit. It was hoped that the extended scale of the Institution would have allowed of a greater variety of masters and lecturers, and that the profit derived from the superior school would have contributed towards the maintenance of the secondary one; but a short experience convinced the subscribers that such a scheme was impracticable without much larger and more certain funds than they could rely on; they then gave their undivided attention to the agricultural seminary, which, through their increasing exertion, has attained such eminence as may justly entitle them to look forward with confidence to its increasing usefulness, and to its becoming a model for establishments of a similar nature in other parts of Ireland.

"The school and farm of Templemoyle are situated about six miles from Londonderry; about a mile distant from the mail-coach road leading from Londonderry to Newtownlimavady. The house, placed on an eminence, commands an extensive and beautiful view over a rich and highly cultivated country, terminated by Lough Foyle.

The base of the hill is occupied by a kitchen and ornamental garden, cultivated by the youths of the establishment, under an experienced gardener. The ground between the garden and house is laid out in beds in which all the different grasses, clovers, &c. are cultivated with the greatest care. The house is in this form ▯═▯, with a range of farming offices behind, containing spacious, lofty, and well-ventilated school-rooms; refectory; dormitories; apartments for the masters, matron, servants, &c.

" Each pupil occupies a separate bed; the house can accommodate seventy-six, and the number of pupils amounts to sixty. They receive an excellent education in reading, writing, and arithmetic; book-keeping, mathematics, land-surveying, and geography. This department is managed by an excellent head-master and assistant-master, both resident in the house. The pupils are so classed that one-half are receiving their education in the house, while the remainder are engaged in the cultivation of a farm of 130 Cunningham, or 165 statute acres, in the management of which they are directed by the head farmer, an experienced and clever man, a native of Scotland, who has a skilful ploughman under him. The pupils who are employed one part of the day on the farm, are replaced by those in the school, so that the education always advances in and out of doors *pari passu*.

" The pupils are thus instructed in all the practical parts of farming, and are also lectured several times a week on the theory of agriculture. They are made acquainted with all the properties of different soils, the manures most applicable, and the crops best adapted to each; points in which most of our practical farmers display great ignorance. They are also made acquainted with all the numerous varieties of cattle, and their qualities, such as early maturity in some breeds, hardihood in others, and have strongly impressed on them that one of the most essential points in farming, is to select the cattle and the crops best adapted to the situation, soil, &c.

" The stables, harness-rooms, cow-houses, winter-feeding houses, piggeries, barn, and tool-houses, are arranged in the best manner, and the pupils are required to keep them and their contents in the highest order. A respectable and intelligent matron has the superintendence of the dairy, cooking, and cleaning the house, and the charge of the domestic servants.

" The formation of this establishment has caused its founders an expenditure of above four thousand pounds; of which about three thousand were raised at its commencement by shares of £25 each, taken by the noblemen, gentlemen, and members of the North-west Society. The Grocer's Company, on whose estate it is situated, have been most liberal in their assistance, and have earned a just reward in the improvement of their property, by the valuable example the farm of Templemoyle presents to their tenantry; and it is gratifying to state, that the example is not confined to so limited a circle, but is followed at a very great extent by the farmers to a considerable distance.

" In sending a pupil to Templemoyle it is necessary to have a nomination from one of the shareholders, or from a subscriber of £2 annually. The annual payment for pupils is £10 a year; and for this trifling sum they are found in board, lodging, and washing, and are educated so as to fit them for land-stewards, directing agents, practical farmers, or surveyors, schoolmasters, or clerks.

" From fifteen to seventeen is the age best suited to entrance at Templemoyle, as three years are quite sufficient to qualify a student, possessed of ordinary talents and a knowledge of the rudiments of reading and writing, to occupy any of the above situations. If this very short and imperfect sketch of what must and will become a more generally useful institution, as it is more known and appreciated, should lead the reader to wish any fuller information, he may easily be gratified by visiting the agricultural seminary, or by applying to the zealous secretary to the Committee, Pitt Shipton, Esq. Londonderry, under cover to Sir R. A. Ferguson, Bart. M.P. who will furnish printed reports containing the history of the rise and progress, the names of the shareholders, the rules and regulations of the Society, hours of school and labour, dietary, and a variety of minutiæ, which, though extremely valuable and necessary to be known, yet from their length might prevent the insertion of this outline of the Templemoyle Seminary in those works which, from their circulation, may both increase the utility of the publication, and the knowledge of an institution of which the advantages have been felt and appreciated in the north of Ireland.

"N.B.—Upwards of two hundred young men, natives of sixteen different counties in Ireland, have passed through or remain in the school. Of these, between forty and fifty have been placed in different situations, such as land-stewards, agents, school-masters, and clerks, or employed on the ordnance survey. Nearly one hundred are now conducting their own or their fathers' farms, in a manner very superior to that of olden time; and the accounts of those who have been placed from the seminary are such as to gratify the gentlemen who have its interest at heart, and to convince them that the good seed sown is producing an ample and valuable harvest."

In agricultural schools the boys should be taught how to make and use every implement of husbandry in the best way; they should be able to calculate the quantities of seed necessary for the ground; the probable produce and value of crops; and learn experimentally their most judicious rotation; they should acquire judgment in the qualities, diseases, treatment, &c. of cattle; they should have some knowledge of mechanics, which will prevent them from wasting the powers of cattle in disadvantageous draught, and from using clumsy, ill-constructed machines; and they ought to acquire habits of reading useful books, which will make home and sobriety delightful to them; they should have knowledge in the nature of soils and manures likely to be beneficial or detrimental in forwarding vegetation, under every circumstance; skill in gardening, planting, draining, fencing, &c. Such is the only kind of education suited to those destined to be tillers of the soil, or likely to effect any material change in the present habit which prevails in the farming classes, of scrupulously following the system of their fathers.

The principal obstacles to success in organising schools of this description will be the difficulty of finding teachers who combine talent with assiduity, authority with mildness, zeal with patience, and an individual, or a committee, who will perseveringly watch over all its interests. One hundred acres will be required for a school farm; if it be much less in size, it will obviously be bad management to leave any part, except a small walled-in paddock, for the milch cows and store pigs, under pasture.

In ordinary circumstances, a gentleman farmer may, perhaps, learn (on account of the expenses attendant on labour, and the depredations and other losses to which he is peculiarly liable) that pasturing his cattle is profitable, and unquestionably less troublesome. In school-farms, however, where the supply of labour is always at command, without any extra expenditure, and the quantity of land is limited, the advantages attendant on the minutest economy of land are obvious; even a few sheep could be *confined* in small yards with sheds; cabbage sprouts and garden waste, with occasionally clover, or turnip tops, will fatten them without any sensible, and very little real diminution of the farm produce.

There ought to be at least one agricultural seminary on a great scale in each province of Ireland; the experimental farms in connexion with them would be of incalculable benefit to the agricultural interests, (for there are few individuals disposed, at their own risk, to enter upon a system of speculative cultivation;) and in active communication with these, a metropolitan agricultural board would be most serviceable.

The proprietors of great estates ought to have, in connexion with their country schools, fields for experimental husbandry and *cottage* gardening, the labours of which should be executed solely by the pupils, under the instructions of their master, who, if duly qualified, could communicate much useful information to his pupils, without the solemnity of a lecture, while they are engaged in the field, and according to the turn of a boy's mind, supply that appropriate instruction which may prepare him for the avocations of the farmer. The great mass of Irish peasantry are sufficiently disposed to industry when they have an adequate motive; and the neglected state of their farms, of the small ones especially, proceeds from their want of agricultural knowledge, and the means of acquiring it. The system of agricultural school education, once established, and steadily pursued, would ultimately alter the habits, and remove the prejudices which now oppose the progress of agriculture.

Such a system would enrich the country with a description of men who, of all others, would be capable of giving an impulse to industry, and of calming those differences which are, unfortunately, but too prevalent; they would fill up the space which lies between the very rich and the very poor, and reconcile the extremes of power and dependence; they would form, in a word, that middle class which is the true cement of society, and without which there is neither security nor social happiness.

AGRICULTURAL SOCIETIES—The benefits derived from these, whether national or provincial, have been incalculably great; and each revolving year records some addition to the number of them. The objects and results of these associations are so well known, as to render any details respecting them needless. The newspapers of the passing day (we would especially point out the Mark-Lane Express for its utility in this particular) teem with the list of prizes offered in Great Britain for improving live stock in all their varieties, the invention of new farming implements, &c. &c. and for procuring the best information on all subjects connected with every department of rural and domestic economy. The exhibitions of horned cattle, horses, sheep, and swine, have produced the most beneficial effects in the principal as well as in the least favoured breeding districts; and by a necessary connexion, tillage in all its branches has been promoted. Farm servants, too, have become objects of encouragement; their skill in ploughing, hedging, stack-making, herding, dairy management, cottage husbandry, their morality of conduct, and length of servitude, being subjects of approbation and reward.

The Royal Dublin Society, though incorporated "for the advancement of Husbandry, Manufactures, and the Fine Arts," for a long period lost sight of the principal objects of its association, (perhaps during a portion of that period, from the contemporaneous existence of the late Farming Society,) but within the last few years has again applied a part of its resources to the promotion of agriculture; directly, by holding annual exhibitions of cattle, implements, poultry, and giving premiums for the best specimens of these, and of Irish manufacture; and indirectly, by proposing prizes for essays on subjects connected with the farmer's interests. None of these Societies however are so practically useful, or so fit for the imitation of Irish farming associations, as the Highland Society of Scotland; which, among other mainsprings of special usefulness, pays great regard to agricultural literature. "Its transactions," as has been recently observed by a Yorkshire gentleman, (on the occasion of establishing an agricultural association in the county of York,) "contains, perhaps, a body of more interesting, scientific, and practical information on agricultural concerns than those of any other society in existence." The truth of this assertion will be evident to the readers of the Quarterly Journal of Agriculture. This noble association was instituted in 1784, and on its entering upon its fiftieth year in January 1833, the anniversary was celebrated at a dinner in Edinburgh, his grace the Duke of Buccleuch presiding, the Marquess of Tweedale, and the Earl of Roseberry in the vice chair, and 250 other noblemen and gentlemen attending; four of the original members were present on this most interesting occasion. This society, besides promoting the ordinary objects of agriculture, gives annual aid to a veterinary school under the management of Mr. Dick, and encourages the extension of woods and plantations.

The English Board of Agriculture was chartered in 1794, through the zeal and exertions of the late Sir John Sinclair, who was appointed its president, while Mr. Arthur Young was nominated secretary; and in its original constitution presented a noble array of names, including all the great officers of state, with the two archbishops, and two of the bishops, *ex officio*. In this list are seen the names of men who have reflected the highest honour on England, in history, in science, and in arts.

This great national institution gave considerable impulse to agriculture; in an incredibly short time,* 74 reports of great value were presented, and the survey of Great Britain, as a necessary preliminary to improvement, was completed; 80,000 copies of papers on agricultural subjects were quickly circulated. (The survey was gone over twice to ensure accuracy, and the account of that alone occupied 72 octavo volumes.) A principle, which should always be rigidly acted upon, in all such institutions, was specially regarded at the formation of this society—*that political feelings should never interfere with the appointment of members.* Wherever there is any departure from this fundamental principle, we may anticipate inefficiency, and the dissolution of the society into which party spirit has been allowed to enter. The Central Society of Great Britain and Ireland, formed some years ago, for the purpose of canvassing *political* questions affecting agriculture, if it should continue to exist, will, from the false principle just referred to, be useless for the single purposes for which such associations ought to be formed; and, however useful and desirable in Great Britain, as a *political engine*, to counterbalance the antagonist forces which the representatives of the mere manufacturers are unhappily disposed to oppose to the agriculturists, (though their interests are in reality allied,) this society may prove—it cannot vie in point of utility in developing the still hidden resources of the soil, and encouraging practical and scientific agriculture, with that which has been recently instituted under the designation of the English Agricultural Society, on the model of the Highland and Agricultural Society of Ireland, and based on the following principle:—

> "That no question be discussed at any of its meetings of a political tendency, or which shall refer to any matter to be brought forward, or pending, in either of the houses of Parliament."

ALDER.—Is fit for few farm purposes, and should not be planted, except in wet sour land, unfit for any other timber, or in very exposed situations, for the mere object of *nursing* and protecting other trees, for which purpose it is well calculated, being a very quick grower, and able to resist the influence of blasts, which would destroy other timber. It is excellent for binding the banks of rivers likely to be worn away by currents; and it answers well for under-ground pipes, as it keeps sound for a long time in water; and also for some articles of common furniture. The bark possesses some of the tanning principle, and is used likewise for dying black.

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* See the biographical memoir of Sir John Sinclair, in the Quarterly Journal of Agriculture, No. 33.

ALLOTMENT SYSTEM—A society called The London Labourers' Friend Society, was formed in London in 1833, under the patronage of the late king and his amiable consort, for the purpose of promoting the allotment of land in small portions, to the labouring poor. This benevolent association has been indirectly the means of providing gardens for the English labourers, and thus conducing to the independence and moral advancement of countless families. There are several auxiliary societies, whose rules, originating in a common principle, are very similar in arrangement. The objects of the London Labourers' Friend Societies are—

1st. To increase the social and domestic comforts of the labouring poor.

2d. To promote the improvement of their moral and religious character.

3d. To endeavour to make them generally independent of parochial relief, and thereby to reduce the amount of poor-rates in parishes.

The societies propose to attain their objects

By letting small allotments of land to labourers, proportioned in quantity to the size of their families, at fair rents.

By endeavouring to improve the comforts and accommodation of cottages.

And generally, by encouraging the system of spade and garden husbandry.

The rules of the Rugby and Cranfield Poor Friend Societies may be considered essentially those of every local branch:

"1. That the land shall be let for one year only; and that the re-letting of each allotment, at the end of the year, to the former occupier, shall depend upon the good conduct and proper management of such occupier during the preceding year.

"2. That the rent for each allotment shall be paid quarterly, and if it shall be in arrear for ten days after it has been called for, such occupier's take shall not be re-let to him.

"3. That the Society shall pay the parish dues.

"4. That the tenants shall cultivate their allotments solely by spade husbandry.

"5. That upon no account shall any tenant be allowed to under-let his allotment.

"6. That if any occupier be detected in any act of dishonesty, or being a drunkard, or frequenter of public-houses, and shall (after having been reproved) still persist in such a habit, he shall not be allowed to continue to rent his allotment after the end of the year.

"7. That any occupier trespassing upon his neighbour's allotment, or suffering his children to do so, shall also not be allowed to continue to rent his allotment after the end of the year.

"8. That whenever the members of this Society shall consider that any occupier has not fulfilled the above regulations, they shall be at liberty to direct their superintendent to take possession of such occupier's allotment at the end of the year; making such satisfaction as the superintendent shall think reasonable, for any crop that may be growing thereon.

"9. That a Secretary and Treasurer be appointed, in whose names the allotments shall be rated; and that it be the business of such officers to receive the rents from the superintendent, and to pay the rent or rents due from the Society, and that it be competent to such Secretary to call a special meeting, from time to time, by affixing ten days' notice on the two principal church doors.

"10. That a general meeting of this Society be holden the first Monday in May, annually, at the Vestry-room, at six in the evening."

RULES AND REGULATIONS AT CRANFIELD.

"1. The rent to be paid on the 11th of October.

"2. No occupier shall be suffered to re-let his allotment.

"3. No person shall be employed on the land who does not belong to the parish.

"4. No occupier shall be allowed to plough his land, but be required to cultivate it solely by spade husbandry.

"5. If any occupier be found neglectful in the cultivation of his land, he will not be permitted to hold after the current year.

"6. No occupier who is at work for the parish, or for any employer, will be allowed to work upon his land after six o'clock in the morning, or before six in the evening, without permission from his master.

"7. No occupier will be suffered to trespass upon another's allotment.

"8. All occupiers will be expected to attend regularly at divine service; to conduct themselves with sobriety at all times, and to bring up their families in a decent and orderly manner.

"9. Any occupier who may be convicted of thieving, or of any other offence against the laws of the country, will be deprived of his garden.

"10. Any dispute amongst the cultivators to be referred to twelve of those renting the soil; the nomination to be with the Committee."

The allotment system has produced the most beneficial results in England, where 70,000 families have been supplied with gardens through its instrumentality. The poor-rates have been considerably reduced, and industry, sobriety, and self-respect have been manifested wherever the system has been in operation. The Bishop of Bath and Wells, who is a leading member of the association, has five hundred tenants on small allotments on his own estate; and many other individuals have located numerous families in the same way. Captain Scobell, one of the most efficient members of the Society states, that the average produce of the land thus parcelled out is £25 per acre, "but he would take it at £20, which would give £3,500, (for 175 acres,) while the rent of the land was £350 per annum; and all this was produced by displacing about 40 cows, or two cows to a parish."

The annual contribution of ten shillings entitles the contributor to be a member of the Society, which has now many Irish subscribers, and to each member the very valuable monthly publications of the Society are sent free of charge. To Ireland the attention of this association is especially directed, for there the condition of the cottiers is most miserable.

All Irish landholders should arouse themselves to the necessity of lessening the heavy pressure of poor laws, which they must soon bear, by a prompt and willing surrender of cottage allotments to the subtenantry, who now dwell upon their estates, without comfort to themselves, and yet with manifest disadvantage to the property on which they live.

ALUMEN, or ARGIL—One of the earths—see *Earths.*

APIARY—see *Bees.*

ASH—The propagation and management of this tree is exceedingly simple, and no timber, except the oak, is of more value to the farmer The general uses to which this timber is applied, are well known to every farmer, who will find his account in planting ash-quicks in his hedge-rows. In the course of ten years the timber becomes of *some* value, and after being cut down as required for use, new stoles shoot up, which, if pruned, will renew the vacancies. At the age of sixteen years ash is valuable to the wheelwright, and is much sooner serviceable for hop-poles, &c. It, however, allows no very near neighbour, as it takes more than its fair share of nourishment from the soil, which it impoverishes more than any other tree, and, therefore, it should be planted at considerable intervals in hedge-rows. The profits of ash by the acre, planted in rows two feet apart, where there is a demand for hop-poles, have been estimated at vast sums.

ASHES—see *Manures.*

ASPEN—see *Poplar.*

ASS—This useful animal first came into the west of Europe from Asia, and might be greatly improved, by care in procuring large and active sires—such as those of Arabian origin which have been imported, but very rarely, from the island of Gozo in the Mediterranean, which are sometimes fourteen hands high. The ass, if fairly treated, is docile and sagacious; his obstinacy and supposed stupidity, are the effects of brutal treatment and injudicious training; if kindly used he is both good-tempered and sagacious, and from the readiness with which he attaches himself to a kind master, he ought to be an especial favourite with *boys*, who usually have the care of him; but who, with the too obviously natural and instinctive cruelty of the human race, abuse him, as if he were unworthy of any consideration or care whatever. His patience under privations and blows, his humility, his extreme moderation of appetite, both as to quantity and quality of food, which ought to conciliate kindness and respect, expose him to the utmost neglect, to half starvation, overloading, and overdriving, with a cudgel or goad to stimulate his efforts. We have seen 18 cwt. of coals weighed from a cart, drawn by a miserable looking ass from the colliery of Castlecomer to Leighlin-bridge, and this on a road both hilly and rough. The low price at which the ass is usually purchased, frequently renders his savage and drunken owner indifferent about him, and he therefore keeps him incessantly employed in the severest drudgery. Thistles and many bitter herbs rejected by the horse and mule are his dainties, and he is only particular as to the water which he drinks, refusing to taste any that is not clear and sweet; unlike the horse, he drinks very delicately, and does not dip his nose into the water, frightened, it may be, at the shadow of his long ears on the surface of it. He is very useful on a farm, saving the labour of a horse in opening small drills, earthing cabbages, carting home turnips or rape to the cow-byre, going to the mill or market, turning a churn-wheel, and performing numberless other services. As if to save trouble to his driver, who should be selected for his kindness to domestic animals, he rolls himself after labour on a rough and hard road, and rises refreshed and good-humoured; he is seldom or never sick, nor completely past his labour, if tolerably well used, until the age of thirty. He is generally worked at the age of two years, but he ought not to be put to labour until he is fully three years old, though he may be trained sooner. Both male and female will breed at two years old. The milk of the female being very light and nutritious is used by persons of delicate stomach, and the skin is used for drums, parchment, and various purposes for which its elasticity and hardness render it most suitable.

ATMOSPHERE, or AIR—Was considered by the ancients one of the four elements of the world, never having been duly analysed, or its composition fully understood, until the close of the last century. It is now ascertanied to be a compound body, containing different gases, but *principally* composed of two—oxygen, and azote or nitrogen. Carbonic acid gas, itself a compound, is found in the atmosphere, but only as one part in a hundred, except in the vicinity of great manufactories and populous towns; and hydrogen, also called inflammable air, exists in it, though in a very inconsiderable quantity. Water is obviously among the ingredients of air; clouds and vapour deposit water as they pass, and it descends in night dews, evaporated by the influence of the sun during the preceding day. When the warm air of a room is suddenly cooled by a change in the temperature of the external atmosphere, it deposits water on the glass of the windows. Dr. Halley has made it appear that from the surface of the Mediterranean Sea, in one summer's day there exhale, by the heat of the season alone, 52,800,000,000 tons of water! Thus in the ever-revolving operations of nature, water is again and again absorbed by the heat of the sun from the earth's surface, and re-combined with the other substances which constitute the atmosphere. The proportion of the principal gases per cent. are as follows:—

Azote	77½
Oxygen	21½
Carbonic acid gas	1
	100

The portions of hydrogen, and of some other gases, are too trifling, and their presence too imperfectly ascertained, to be taken into consideration in estimating the relative quantities of the substances which combine to constitute air.

Carbonic gas is generated from animal and vegetable matter while undergoing the process of putrefaction and fermentation, and cannot be destroyed, except through the agency of plants while in a healthy and growing state; these imbibe it as the great source of their nourishment, for which it seems specially intended. It is destructive of *animal* life if it abounds beyond a certain proportion in the atmosphere. The power and design of the Creator in blending this gas with the other atmospheric fluids, so critically as to make it suffice for the wants of vegetable, while it does not prevail so as to injure animal nature, to which, in any excess of quantity, it is noxious, are, like his wisdom and benevolence in every department of the mundane system, admirable and conspicuous; and whenever the due proportions of the atmospheric ingredients vary much, health is interrupted. Dr. Harty, in his able work on the causes of Epidemic Fever in Ireland, observes:

> "It is probable that some of the obvious properties of air, such as its excessive wetness, coldness, and heat, may exert some direct influence in assisting to diffuse fever, by their immediate effects on the human system, on which account it is, that the deficiency of fuel so severely felt during the years 1816, 17, and 18, may be

admitted as a concurrent cause of the epidemic which then prevailed, that article being essential in counteracting the influence of moisture and cold, the then predominant properties of the atmosphere."

Oxygen, so indispensable to the life of man and all other animals, that they expire when it is withheld, is in some degree necessary to the support of plants, which absorb a portion of it; it quits its æriform state and becomes concrete in the organs of plants, and gives strength to the stem by forming the ligneous fibre; seeds cannot germinate without oxygen, and it is actually found in some vegetables—the gluten of wheat for instance—but in extremely small quantities, and also in vegetables when reduced to a state of putrefactive fermentation.

The use of azote is not yet distinctly known; the great chemist alluded to in the preface, says, that it prevents the action of oxygen from being too energetic, and may be considered as a medium in which the more essential parts of the air act.

Hydrogen is another gas found in air. It is extremely light and inflammable; the term is derived from two Greek words, which express its agency in forming water, which (strange as this must appear to those who are ignorant of chemistry) it produces when combined with oxygen; it is one of the principal constituents of vegetables, from which it may be extracted by distillation, and these, when in a fermenting state, will produce it as well as animal matter—putrefying fish-bones, for example. When combined with phosphorus in rotten timber or marshes, it glows with a pale clear light, to the terror of the ignorant and superstitious, under the denomination of "will-of-the-wisp." This is the gas so fatal in mines, where, coming in contact with pyrites, it causes awful and fatal explosions; its weight being $\frac{1}{13}$th less than that of the air, it is used for inflating balloons.

The action of the air is perceptible to the most common observer: it is the great secondary agent which pervades the world—"in air all bodies live, move, and have their being." There is scarcely any liquid which has not air intermixed with it—scarcely any solid out of which it may not be extracted; so that it is hardly possible to specify any operation of nature which occurs without its presence and instrumentality.

The healthy action of the human body is especially influenced by its variations, and even plants are affected by being confined in ill-ventilated or too close a space; the decay of their leaves, and other unequivocal symptoms of disease, will manifest their want of fresh air, and by a beautiful system of reaction, the atmosphere is improved and rendered more vivifying and generative by the absorbing powers of vegetables, which during their growth consume much of those particles of air, which, as already intimated, supply the principal sustenance of plants, and which, if not so consumed, would be destructive to the life both of man and beast. A free circulation of air—with its full proportion of oxygen in particular—is essential to the fertility of the soil, as is well known to every person who has remarked the sterility of any body of earth found far beneath the surface, or earth dug from a pit, to which air has not had free access; though when pulverized by the atmospheric influence, by moisture, frost, and frequent stirring, it will give luxuriant products.

> "It is shown by various researches, that the constitution of the atmosphere has been always the same since the time that it was first accurately analysed; and this must, in a great measure depend upon the powers of plants to absorb or decompose the putrefying or decaying remains of animals and vegetables, and the gaseous effluvia which they are constantly emitting. Carbonic acid gas is formed in a variety of processes of fermentation and combustion, and in the respiration of animals; and as yet no other process is known in nature by which it can be consumed, except vegetation. Animals produce a substance which appears to be a necessary food of vegetables; vegetables evolve a principle necessary to the existence of animals; and these different classes of beings seem to be thus connected together in the exercise of their living functions, and to a certain extent made to depend upon each other for their existence. Water is raised from the ocean, diffused through the air, and poured down upon the soil, so as to be applied to the purposes of life; the different parts of the atmosphere are mingled together by winds or changes of temperature, and successively brought in contact with the surface of the earth, so as to exert their fertilizing influence; whilst the modifications of the soil, and the application of manures, are placed within the power of man, as if for the purpose of awakening his industry, and of calling forth his powers."

The importance of pure air to the health of man is incalculably great; many maladies arise solely from a vitiated state of the air, or from the extremes of dryness or moisture; excess of dampness, for instance, relaxes and deranges the whole nervous system, and renders us liable to many forms of disease, and to the various ailments of which our nature is susceptible, when our organs are unbraced, and consequently powerless to resist the morbific action of impure air.

It is indeed a remarkable and somewhat singular fact, fully illustrated in Dr. Harty's work, already referred to, that the extremes of heat and cold, dryness and moisture, have in Ireland produced deleterious effects, nearly similar in their nature. Thus, he says, p. 141, that "though the epidemic fevers of 1741 and 1817 agreed in their essential characters, yet the epidemic seasons themselves differed most remarkably in the weather peculiar to each: *that* of 1741 being characterised by two very severe winters and two very dry summers, one of which was very hot; *that* of 1817 being, on the contrary, characterised by mild winters, and very wet and cool summers." Dr. Harty, it is true, infers from this that the state of the weather exerted therefore no *direct* influence in producing the fever of either year, that influence being, as he supposes, merely *consequential* in its operation on the harvest; so that the very dry as well as the very wet summers being equally destructive to the produce of the earth, were thereby equally instrumental in exciting epidemic fever through the medium of famine and its effects. Whatever truth may be in this opinion as regarding the indirect agency of the weather, in the production of epidemic fever, there can exist little doubt of the direct influence exerted by the general or local atmosphere in producing ague, a disease once very prevalent in these countries, and still very common in particular districts. This disease, so notorious for infesting low marshy situasions, or whole districts not adequately drained, was once the great prevalent complaint both of England and Ireland, before the increase of population, and the improvement and extension of agriculture, led to the clearing of woods, and the proper drainage of the soil. But independently of the undoubted influence of particular localities in producing a morbid condition of the atmosphere, and the consequent prevalence of ague in those special districts, there exists at particular seasons a general disposition to aguish complaints, unconnected with any morbid local influence emanating from the soil, but dependent on the general character of the atmosphere, more especially after a long and unnatural or unusual prevalence of easterly winds. Indeed, every one who has once suffered severely from ague, is ever afterwards peculiarly and morbidly sensible to the influence of those winds.

Thus we may perceive that besides the other numerous benefits conferred by the successful prosecution of agriculture, that primest of arts and sciences is both directly and indirectly calculated to banish, or at least most seriously to diminish the evils consequent on the spread of epidemic fever and of ague,—in the latter case by purifying the atmosphere, and in the former by the same agency, as well as by preventing the risks of famine.

In climates like that in which we live, subject to perpetual variations, and especially exposed to the south-west gales, which, passing over the Atlantic Ocean, convey to us frequent supplies of pure air, that class of diseases, originating in an extremely dry and stagnant atmosphere, is comparatively unknown. But the air wafted to the British islands by the vast ocean which bounds them, though salutary in dispersing any contaminating particles which local causes may engender, has an excess of humidity often pernicious in its effects on the mind and body of man, and rushes with a degree of force, destructive of many species of trees and plants of delicate formation. By the providence of God, peat (turf) fuel is abundant in the bogs and mountains of Ireland and Scotland, countries much exposed to humidity; and in the free use of fuel in the poor man's cabin, the most efficacious purifier of the air is found. It is, however, a vulgar error to infer that fire of itself corrects the impurities of the air; it is by causing a free *circulation* of it through the introduction of fresh and pure air in place of the contaminated atmosphere which it expels, and also by correcting the dampness of rooms and furniture, that the agency of fire is beneficial. The *mode* of its operation is by *rarifying* the stagnant air of a chamber, rendering it *lighter* than that surrounding it, and expelling it by the chimney or some other suitable outlet, and consequently allowing space for the influx of fresh air in its place.

If a room be closed (the chimney only open) against the admission of a fresh body of air, fire, instead of purifying the confined atmosphere, will render it more noxious; let any person who doubts this, light a fire and close the door and windows of a room carefully, he will soon find the pent-up and rarified air unwholesome for breathing, and his fire will go out. Many persons have fatally experienced the effects of a fire in a closed room; especially if sulphurous or carbonic gases are disengaged from the fuel in large quantities, inattention to the circulation of fresh air will render respiration difficult or oppressive.

In the labourer's cabin the door is generally open while the fire is burning, and therefore all the comforts which it usually imparts are enjoyed by the inmates, who are sheltered from the current of external air by a screen or little wall interposed between the door and the fireplace; but in the close lodging-rooms of the mechanic, in cities and other confined places, and also in the chambers of the richer and more luxurious classes, every avoidable access of fresh air is often scrupulously excluded, while fires are heating the house to an insupportable degree.

It used to be the custom to stop up every opening in the rooms of the sick, especially in fever cases, and thus to make them inhale, over and over again, the air which had passed through their diseased lungs, rendered more contaminated by every successive respiration; but happily science, and experience, have shown the absurdity and mischief of such treatment, and free ventilation is now established, in fever hospitals especially, where care is taken to have a thorough draft of air; indeed, in all houses there should be doors or windows at the back as well as in the front, for the purpose of efficient ventilation; sleeping rooms in particular should be well aired, for in the morning the air is found to be tainted by the breathing, as well as by the natural exhalations of the human body; and close curtains should never be used.

The humbler classes living in the country, owe much of their hardihood to the constant circulation around them of an uncontaminated atmosphere, and to their habitual exposure to it during all hours of the day, by which they are rendered less susceptible of morbific vicissitudes or alternations of the atmosphere, while the unhappy dwellers in the confined lanes of cities and other localities exposed to stagnant air, tainted with putrid effluvia, become enervated, and fall ready and unresisting victims to the epidemic maladies which pass lightly over the more robust peasantry dwelling in the purer atmosphere of the country.

AWN—The beard growing out of corn or grass.

BACON—

"High o'er the hearth a chime of bacon hung,
Good old Philemon seized it with a prong—
Then cut a slice."

Every farmer should always have a flitch or two of bacon in his kitchen ready for the knife and pan, and therefore ought to know how to kill and cure it. Swine should be kept from food for at least 12 hours previously to being killed, in order that the stomach and intestines should be completely cleared from food or fœces, which if accumulated within, will prevent them from being properly divested of all the mudgen lard; as the puddings are desirable to all except Jewish housekeepers, great care should be taken in separating them from the lard, not to burst or break them.

The hammer used in knocking down a pig should be oval in form, two pounds in weight, the handle at least three feet long; the blow should descend one or two inches above the eyes, inclining a little upwards; if given exactly, it will instantaneously deprive the animal of life, but if higher than the forehead it will lose its effect, as the skull is protected by the fleshy part of the pate. The pig should then be put upon a narrow table, so as to allow the fore and hind legs to hang over each side; the butcher taking hold of the upper fore-leg in his left hand and drawing it towards him, should then take a sharp-pointed knife, one inch in breadth and eight in length, in his right hand, with the back towards himself, and introduce the point into the throat in a slanting direction, so as to cut the main arteries, and before drawing it out, he should give it a slight turn to one side, by which it will cut any of the arteries it may have missed in its entrance.

The old mode of killing pigs was both bad and cruel: the poor animal was either held on the ground or thrown on a table to have the throat cut; in some cases the head was cut off, but not with despatch; by this mode the wretched brute suffered so much pain that all the sinews were contracted, thereby preventing the blood from flowing out of the minor veins; consequently, the bacon could never be perfectly cured, without being put into strong pickle, which should not be resorted to unless the pig has been bruised or over-driven previously to its being killed. When the blood is to be used, it should be preserved in a pan and kept smartly stirred (adding a little salt) until quite cold, when it will become as thin as cream.

Scalding may be easily effected by immersing first the head and shoulders, and afterwards the rest of the body, in a boiler or tub, the water being at the temperature of 140°. When the hair can be taken off by the fingers, it will be time to withdraw the body. The head and shoulders should be cleaned first, then the hind quarters; the whole carcase may then be perfectly cleaned on a table, by applying a little cold water; after freeing it completely of hairs and every foulness of skin, it is to be hung up and opened; the guts are then to be taken out and separated from the mudgen lard. Persons killing pigs for private use should make the butcher take out the side lard while the body is hot, particularly in warm weather, for by so doing the flesh becomes firm in a short time, and will in all cases take the salt much better than if it were soft.

The method of scalding pigs used by many of the Scotch farmers is very ingenious: the pig is put on the floor, on a bed of chaff or mill-dust, six inches thick, lying either on the back or stomach; the body is then covered with a layer of chaff or dust four inches thick, leaving a small hole in the centre, at which the hot water is poured in, which runs over the body—both the heat and steam are kept in by the chaff. After a little time the chaff is removed, when the hair can be taken off without any difficulty.

The carcase should remain suspended for 12 hours in winter, and 18 in summer; then cut it up, by first opening the back down, so as to leave the back-bone bare on each side; it should then be sawn or cloven; four hours after this, the flitches and hams should be salted.

The hand of the salter should be guarded by a glove of canvas or leather, in the shape of a smoothing-iron, soled with hard wood, and studded with large nails (of a peculiar form, presenting eight sides, and somewhat like inverted cones) at intervals of 1¼ inch, so placed as to prevent the surface from being filled up and levelled with the salt. In the act of rubbing, the salter should keep a dish of pickle on the table, with which to wet the meat constantly.

The flitches should be laid on a clean floor, (flagged if possible,) with a little salt thrown on it before the flitches are laid down; the thin flitch should be raised by means of a stone or board to a level with the thick, so as to form a hollow, the whole length of the flitch; the saltpetre is then to be shaken over, after which a light layer of salt is to be laid, and the hollow filled with as much strong pickle as it will contain.

When two or more pigs are being cured in this way, a short board should be laid over the hollow of each uppermost side, to prevent the next side when laid, from sinking into it; after lying in this position for eight days, each side should be well rubbed over with a strong broom. When there are many flitches in process, they should be re-piled double the former height, with a sprinkling of dry salt between each.

At the end of five or six days the flitches should be taken down and washed in fresh water, then hung up in a chimney or stove until quite dry, when they may be packed in seeds until required for use.

The hams are to be treated as follows:—to be rubbed (with a glove as before described) once on the day they are taken out of the flitch, twice the day after, and saltpetred; then to remain three or four days undisturbed; the large end to be raised a little so as to allow the salt to penetrate into the shank; then to be again salted and left for eight days longer, when they will be ready for hanging, being first washed as in the case of bacon. The temperature of the room should be about the heat of a common kitchen; wood fires are the best—if a fine flavour be desired, *oak* saw-dust or shavings should be burned. In the course of three weeks the bacon and hams will be fit for use.

The treatment of pates and skirts.

The tongue may be taken out, or jowls cut from ear to ear, including the lower jaw and tongue, or the head may be split down through the under jaw, and (the brains having been shaken out) rubbed with salt, and put into strong brine for eight or ten days.

The lard should be of *two* qualities, the finest and whitest (that taken from the sides) should be chopped into small pieces in a pan, over a slow fire, and kept constantly stirred, lest it should stick to the sides of the boiler; then strained and put into bladders, turned inside out, and thoroughly purified, by having all the fat cut out, and being well blown, and perfectly dried in the open air; when the wind is pressed out, they are to be put into a little salt pickle for a few days, then washed in luke-warm water, after which they may be turned by means of a stick. That of the first quality, when well made, is far better than any salt butter for cookery, and from the delicacy of its colour is used by confectioners for the finest kinds of cake and pastry.

The inferior lard is obtained from the *intestines*, and is treated as the fine lard in every particular. The feet, when taken off, are chopped in two or three places, and put into brine, in which they may be kept until required.

Both the hair and bristles are serviceable for brush-makers and cabinet-makers' purposes. No part of the pig is useless; even the intestines are converted into an inferior kind of lard, by being cut open and washed clean, and (after the water is well pressed out of them) melted in the same way as lard; this substance is very useful for making candles, greasing wheels, and such purposes.

The best sized swine are from 1¾ cwt. to 2 cwt. weight.

Though there is a strong prejudice in favour of English bacon, the fact is, that the great supply of bacon and pork used in England is from Ireland; and those who slaughter and save for the English market assert, that swine well fed on farinaceous potatoes, are firmer in the fat, and *stand the salt* much better than English meal-fed swine, which are soft and flabby. Oats or peas mixed with potatoes, for a month or so before killing, is the most hardening food.

The misfortune is, that the Irish pig is too frequently fed on grass, the mere *refuse* of potatoes, or the skins and *potato water*, (which is in some degree poisonous,) with a little bran or *distillers' grains to make him up for market!* No wonder that the flesh of such swine should be soft and bad. Until the Irish peasant becomes improved in his condition, and enabled by steady and permanent employment, (and the abandonment of dram-drinking,) to experience the comfort of having a bit of *good* bacon hanging up in his house, he will neither know nor care how to feed, kill, or cure a pig. We heartily hope that the following lines will not always be applicable to our poorer countrymen.

* * * * * *

"As in some Irish houses where things are so so,
One gammon of bacon hangs up for a show;
But for eating a rasher of what they take pride in,
They'd as soon think of eating the pan it is fried in."

BARLEY—Professor Low enumerates six varieties of this grain, and gives the botanical distinctions, but of these there are only four kinds cultivated in the British Islands.

The finer and more cultivated species have long ears filled with large grains.*

Of the six-row kinds, that now known by the name of the Chevalier, is the most productive. It is said that a man of the name of Chevalier, observing some very fertile ears in a crop of barley, separated them from the rest, and by sowing the grains separately, gradually propagated the variety which goes by his name. Some persons, however, have given up the culture of this species, alleging that the stem frequently fails to support and nourish the head!

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* Professor Low explains the reason why barley is called two-rowed and six-rowed —"according to the number of its fertile florets. In two-rowed barley one row of florets on each of the two sides of the spike is fertile, and consequently one row of seeds on each side is perfected. In six-rowed barley, three rows on each side of the spike are fertile, and consequently three rows wide on each side are perfected; in this sense only it is termed six-rowed barley, but there is no species known to us in which only two rows on each side of the spike are fertile. Slightly examined, indeed, six-rowed barley frequently presents the appearance of four-rowed, but this is in appearance only, for such barleys have always the three rows on each side perfect. In poor soils and unfavourable situations, two of the rows run much into each other, and this perhaps has given rise to the mistake; but the two rows which thus run into each other in appearance, are on the opposite sides of the rachis."

In the baronies of Forth and Bargy (in the county of Wexford) the culture of this barley has been abandoned from the cause just stated, and also from the inferiority of price obtained from the *maltsters*—the difference of price in the last season having been 3s. in 16 stone. One test in its favour is, that it is decidedly preferred by *millers*, from the thinness of its skin. The abandonment of the culture of this species in the great district referred to, has probably been precipitate. Mr. Harper, a seedsman in Wexford, sowed a crop of it on the 18*th of June*, 1837, and had a *remarkably abundant crop*. As an article of human food, barley is extensively used in England and Scotland, where it is consumed in soup as well as in bread; after being prepared in the barley-mill, ground into flour, it cannot be distinguished from the first quality of that from wheat.

In Galloway, and many other parts of Scotland, barley constitutes the dinner and supper meals during the summer months, prepared as follows: a sufficient quantity is put into a pot and boiled gently, until it becomes soft; when cold it is mixed with a little sweet milk and soft sugar, or salt. It is most desirable that barley should be used in this way in Ireland, during the summer months, when milk can be procured, as it is considerably cheaper than oatmeal or potatoes, and much less heating in its nature than the former article of food. One pound and a half is sufficient for a meal for a family of average number, and the cost of this is not more than *three half-pence* or *two pence*. It is an universal ingredient in soup for the dinner meal among all classes in Scotland. For syrups and decoctions, barley tea is excellent, and the *chevalier* is preferable for all the above purposes. After being shelled in the barley mill, it is sold and known by the name of French barley among us. The farmer can have it prepared in the Scotch mill for one shilling per cwt.; if he buys it in a shop under the imposing name of French or Pearl barley, he must pay at the rate of 5d. per pound, or about £4 13s. 4d. per barrel!

Of bere or bigg, there are hardly any distinct varieties. This kind is rough and hardy, and ripens earlier than the finer kinds; the awns adhere closer to the grain, as if to protect it in the cold climates and soils to which its culture is usually limited, as in the North of Scotland, in Denmark, and in Sweden.

This description is generally sown in October, and is sometimes called winter barley. The grains do not weigh as heavy, in proportion to their bulk, as those of other kinds, which is one of the causes of its inferiority.

Barley with a thin skin, round, and full in grain, with a bright colour, which exposure to the weather injures, is most mealy, and, therefore, the best for all uses. Barley requires in its culture a dry well-pulverized and clean loam; wet and coarse lands being unsuited to it; the demand for this grain is always great, and in years unfavourable to wheat, its value becomes considerable; its success is less uncertain (on suitable soil) than that of wheat or oats, and when these, in bad years, have little flour, barley (its average produce is 12 pounds of meal from 14 pounds of grain) often contains a fair proportion of meal. Barley is not susceptible of mildew; and smut, if ever it affect it, does so in a very trifling degree. Being sown late in the spring and reaped early in autumn, it is unlikely to suffer from frost, unless in very elevated and northern situations, where the finer kinds ought not to be cultivated; in wet seasons, if the soil be too rich, it lies down and becomes matted, ripens unevenly, and loses its colour.

In Ireland, like all other grain, it is allowed to become dead ripe before reaping; it should be cut when the head droops. With respect to the mode of cutting and saving it, different habits prevail,—in England it is always cut with scythes, and racked up and ricked like hay. Where manual labour is dear, and the stem stands well against a scythe, and the ground is perfectly clean, as is always the case in England, mowing is the most advantageous mode; but if the straw be broken down, and the ground dirty, as is almost always the case in Ireland, the reaping hook is best.—(See *Scythe.*)

One of the consequences of weeds growing luxuriantly through barley, is the necessity of leaving it many days on the ledge, often in very uncertain weather, to avoid the fermentation, which would take place if it were bound and stacked, or even stooked, before the weeds and grasses have withered. Barley, on account of its being sown late, is the best grain with which to sow grass seeds and clover.

Potato fields, if designed for barley, should be ridged up after the removal of the crop, in order to have the ground in dry and friable state for the sowing in spring, when the ridges should be split with the plough, the field harrowed, and then lightly ploughed thoroughly, and rolled either before the barley makes its appearance above ground, or soon after; if grass seeds be sown, the rolling should be immediately after the sowing of them; and these seeds may either be sown before or after the last scrape of the harrow. Barley succeeds remarkbly well after turnips, which usually remain in the ground until spring. In many parts of Great Britain barley is sown in drills, at intervals of 7 or 8 inches, and we ourselves are inclined to recommend this practice where the land is in high tilth; there is a saving of seed by this mode, 12 or 14 stone being sufficient (if a drill machine be used) for an Irish acre—which, if sown broadcast will require 24 stone, the facility given to grass seeds of establishing themselves freely between the drills, and a greater produce of corn, are also to be credited to the drill system.

The supporters of the broad-cast system, however, assign very fair reasons for their preference; barley is a grain which does not require hoeing, and, therefore, need not on that account be sown in drills, and plants are thrown so much together that they cannot tiller as freely as if they were evenly diffused over the surface. Mr. Edward Carrol, of Edenmore, has made the following experiments, which we give in his own words, as published in the Irish Farmer's Magazine:—

"I shall briefly submit to your notice a few experiments tried from time to time, on various soils and in different counties.

"The first was with a crop of barley on a 'worn' soil; slaty sub-soil, remarkably dry. No. 1—drills 18 inches apart; No. 2—15 do.; No. 3—12 do.; No. 4—drills 9 inches asunder; and No. 5 sown 'under' (provincially termed, meaning its being sown and ploughed in)—ridges 5 to 6 feet wide, rounded in the centre, the common method in the part of the country in which the experiment was tried. The average produce, same place, ten to twenty barrels per Irish acre, varying in proportion to the quality of the soil—but on such land as that under consideration, fifteen barrels the highest expected.

"The proportions borne by the drills to the ridge or broad-cast system here being—No. 1—as 12 to 15; No. 2—as 14 to 15; No. 3—as 16 to 15; and No. 4—as 18 to 15. The quantity of seed used per acre, 16 stone.

"Experiment 2nd—on an alluvial medium soil, argillaceous sub-soil, drills and broad-cast, as in experiment No. 1, but produce different; the drills 9 and 18 inches asunder, being both below the broad-cast in produce, whilst those 12 and 15 were somewhat above it.

"Experiment 3rd—with a crop of barley on two kinds of soils, namely, a fine rich loamy soil on a calcareous sub-soil; the other on a stiff retentive soil, blue clayey sub-soil. In all cases on the rich soil, drills same width as Nos. 1 and 2, but broad-cast, covered from the furrows or sown over, the drills exceeded the broad-cast. The 9 inch drills by upwards of 10; the 12 inch by 15; the 15 by upwards of 20; and the 18 by upwards of 25 per cent. Seed sown, 8 stone per acre.

"On the stiff clayey soils the proportions were in favour of the 15 inch drills, but all somewhat below the broad-cast. The crop on the whole very inferior. Seed, 14 stone per acre.

"Experiment 4th—on a rich loamy soil, sub-soil somewhat calcareous. No. 1—drills 15 inches asunder. No. 2—broad-cast sown under, on ridges 6 feet wide. No. 3—sown 'over,' same kind of ridges, furrows shovelled up to assist the covering. Proportions were, (ridges sown under) to drills, as 9 to 13; do. sown over, as 11 to 13. Seed, 8 stones per acre.

"Experiment 5th—on a rich strong loamy soil, tenacious sub-soil, and on a strong gravelly soil, *retentive* sub-soil—season exceedingly dry; all drilled 15 inches asunder: proportions, on the retentive sub-soil, *hilly ground*, to the loamy as 13 to 16. Seed, 10 stone per acre.

"From the above experiments I am warranted in the following inferences: first, as regards the culture on suitable soils, that the drill system is superior to the broad-cast, however the latter is performed; and secondly, that narrow drills are better adapted for light poor soils, drills of medium width for medium soils, and wide drills for very rich or moist soils—the narrowest drills not less than 9, and the widest not more than 18 inches between centre and centre; and thirdly, that the quantity of seed should be proportioned to the quality of the land—wide drills, on rich land, requiring the lesser, and narrow drills on poor land the greater quantity."

Mr. Carrol assigns as his reasons for the above inferences, that barley drilled on poor dry land, laid down flat, as is usual under drill barley, is less likely to be parched in dry seasons, than if in high ridges, (which are used in Ireland under the ordinary broad-cast management,) and that rich land drilled, will better *support* a luxuriant crop in moist or very wet seasons.

The principal use to which this grain is applied, is—the making of beer, ale, and porter, very little, if any, being consumed in the manufacture of whiskey, which is now invariably distilled from oats; some portion of barley is ground into meal, which is, however, more generally used in Great Britain (much of the inferior kind for fattening hogs) than in Ireland, except in periods of great scarcity. In Scotland, when barley is sown broad-cast, as is most general, the practice is to sow the seed on the rough fallow, immediately after it has been ploughed, and to cover it with harrows and roller. The mode in the barley district of the county of Wexford—we know not from what principle—is to sow half under the plough, and the other half immediately afterwards under the harrow, which concludes the operation. This is an obvious compromise between two different systems, lest either alone, should be defective.

The seasons for sowing barley, which requires land of good quality—sandy loam the best, and this in good condition—varies according to the nature of the soil and the situation, from the first of April to the middle of May.

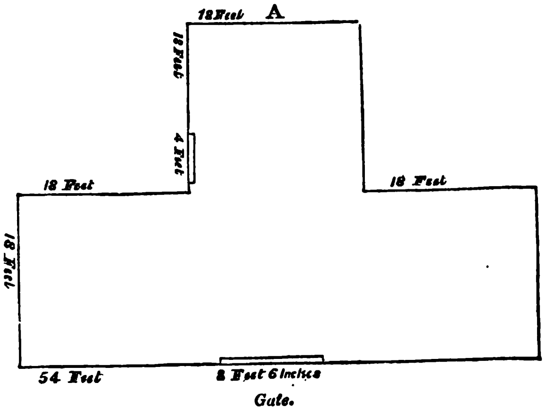
BARLEY CORN—The least of our long measures, the third of an inch.

BARN—It is impossible to lay down any fixed plan of this, as it must depend on the size and circumstances of the farm, and often on the locality of the building itself. For example, if it is to be on a level considerably below that of an adjacent stack-yard, it would be desirable to have the threshing-floor on a loft, instead of being on the ground floor, and on a level, or nearly so, with the stack-yard, for the facility of taking in sheaves of corn above, and of discharging the threshed straw downwards into cattle sheds, or lofts below. In this case, while the upper floor of the barn communicates directly with the higher land, the ground floor is on a level with the yard below. In large farms the height of a barn should not be less than 20 feet, and the breadth should be considerable also, to admit of the erection of cattle-sheds around, except where the external machinery of a threshing mill may interfere, by which arrangement, there may be much accommodation obtained as to room, besides the convenience of supplying straw, or hay, or whatever roots may be occasionally stored in the barn, to the cattle around, through openings in the walls. Timber, the driest and best material for barns, is generally used in England, but in Ireland and Scotland rarely; a good stone or brick building is, however, the most durable. Where a threshing machine is not to be used, the floor should be of oak or other lasting timber, as the flail plays better upon this than on a dead unelastic material, and the corn threshed upon it is free from stones or bits of mortar, and will preserve a brighter colour.

In the first volume of "British Husbandry," there are some excellent plans of barns, granaries, and sheds combined, but calculated principally for very large farms.

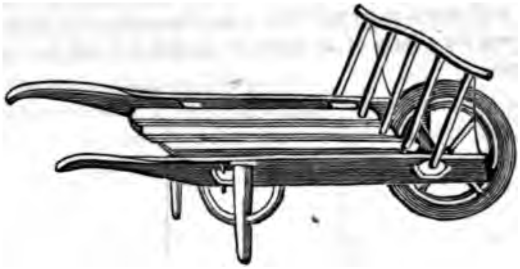
It should be a general rule, except in the unusual instance of the upper floor being level with the stack-yard, to have gates or doors at opposite sides, to admit of the entrance and exit of loaded waggons or carts; the sheaves are to be piled, of course, at each side of the threshing-floor to the extremities of the building.

We ourselves have built on a farm of fifty British acres, a barn which is well suited to a small farm; the dimensions may be so reduced as to answer for a farm of 20 acres, or extended to suit one of 100 or more acres.



> "It may be almost useless to mention the necessity of securing every sieved measure for the use of grain, hung upon its own hook, that it may be in readiness. But if there is one thing that demands more particular attention than another, it is corn sacks, which one sees frequently stuffed with wisps of straw to stop the holes; a disgraceful piece of negligence, the sole consequence of the want of a stitch in time, by which it might have been prevented. Small articles, and these easily wearable, should be carefully put aside the moment they are no longer wanted; but even that is not enough, they should be counted, and if they want repair it should be done before they are put aside, or it surely will be forgotten."*

BARROWS—What can be more useful than these, whether with or without wheels? For bringing larger supplies of vegetable from the field than the barrow with one wheel can convey, one with two wheels of three feet in diameter will be found extremely convenient. Box barrows, borne between two men are often necessary in wet land to move earth or manure; and strong framed ones, not boarded, are indispensable where stones are to be moved for shores or fences, on land too wet for horse-work, or on any small holdings on which a horse should not be kept. Wheel-barrows, like other implements, may be formed in a light and convenient way, or in a heavy and clumsy manner. In great barns, the low-wheeled load barrow, such as is used in flour mills for moving sacks, is very useful, and the light *sparred* barrow, for shifting sheaves from the stack to the barn, is frequently serviceable for saving horse labour, and preventing the waste of corn, consequent on a slovenly mode of conveying sheaves to the threshing-floor.



BEANS—These are indispensable for horses hard and constantly worked, and good, when converted into meal, for fattening hogs. The horse and the tick bean are the kinds cultivated by the farmer; of these the latter is the more productive, though the other has longer stalks. Clay soils are best suited to beans, and the best time for sowing is as early in spring as the weather will permit. The mode of culture varies considerably in England. After the ground has been ploughed early in the year, manured previously, and formed into the wide ridges—which are so general in the clay soils—a man with a dibbler about three feet in length in each hand, walking backwards *across* the ridges, makes holes as he retires, three inches apart in the rows, leaving 7 or 9 inches between the rows; a woman follows and deposits two beans in each hole, and their work is performed, by contract, for six shillings per acre. Another mode in England is to dibble the beans in each furrow slice, as the plough advances.

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* British Husbandry.

The method pursued in the county of Wexford, in Ireland, is to spread fresh sea-weed during the autumn and winter on stubbles, if near the coast, and to plough the beans into the ground in ridges four feet in width, immediately after Christmas, or even before it, (the winter climate there being of mild temperature,) or to sow upon ley in the same way, subsequently chopping the rough clods with a shovel, and giving more cover to the seed from the furrows with spade and shovel, without any subsequent management whatever. More in the interior of this bean district, *composts* of dung or sea-weed, earth, sand, &c. &c. are accumulated in the autumnal and early winter months, and carted out, and ploughed into the land intended for beans, which are sown as in the other instance just stated. But the Scotch system is decidedly the best; in Scotland, drills are formed after previous preparation, as for potatoes, at the distance of 26 inches; in these, short dung is laid, and over the dung the beans are sown; sometimes, especially in wet weather, when the regular drilling may be impracticable, the drill barrow is pushed along, in every third furrow, as the ploughman proceeds, and the beans (covered by the next furrow,) come up in regular rows. "Some farmers (says Professor Low) attach the sowing machine to every third plough, fixing it between the handles in such a manner that it sows the seed in the furrows which it just formed, the three ploughs following each other in succession, and the third sowing the seeds; these are deposited and covered in every other third furrow; in this case the dung (if it has not been applied in the preceding autumn) is merely spread upon the ground before the land is ploughed, and covered by the plough at the time of sowing."

By the Scotch method the horse-hoe can be set at work, and the clearing and pulverizing system—so peculiarly requisite on the tenacious soils in which beans are cultivated—pursued; and without this culture during the growth of the bean, the land is quite unfit for the succeeding corn crop; the hand-hoe, it is quite true, is used in the English method of narrow drills, but there is not room for its free exercise, and the field is frequently filled with couch-grass when the beans are removed. By the Wexford system the greatest degree of foulness is attained, as there is neither horse nor hand hoe, nor even a finger, applied to remove all the varieties of weeds and couch-grass that are disposed in so moist a climate, to occupy the soil. The reasons assigned by those who sow broad-cast in this villanous way is, that in the dead period of the year, when it is desirable to get over the bean sowing, the land is rarely in condition for drilling; but as the fit preparation of the soil for the succeeding corn crop ought not to be a secondary object, it would be better to postpone the sowing of beans until February, (which is perhaps the best season,) or the first of March, than for the mere sake of getting over some work when little else can be done, to render a field one mass of weeds and filthiness. Stubble land intended for beans should be ploughed deep as soon after the removal of the corn as possible, well furrowed to keep it in a dry state, and just before the sowing time cross-ploughed, well harrowed and levelled, and formed into such sized ridges as its nature may require, before the drills are formed, or the dibbling commences. The harrow may be lightly run over the field when the crop is making its appearance on the surface, to assist the progress of the work, and to destroy seedling weeds. When the plants are about three inches high, the horse-hoe or scuffler and drill-harrow are set to work, and the weeds between the plants taken out with the hand-hoe; the crop should then be earthed up. When the seeds become yellow the beans are ripe, and may either be cut with the sickle or pulled up by the roots, as in the county Wexford, where the haulms or stalks are used, not for fodder, (as elsewhere very advantageously,) but for fuel. It is, however, decidedly more economical to reap than to pull the stalks, for in this case they become dry sooner, from the free circulation of air in the hollow of the stalk; and the severe labour of pulling is saved to the hands: but the principal reason is the clean state of the haulm, which ought to be used as food for cattle, as is the invariable practice in the best dairy districts of Scotland, where the coarse parts are given to horses as a substitute for hay during the spring months, when nutritious food is so necessary for them, and the finer parts are boiled for milch cows and mixed with turnips, chaff, &c. steamed or boiled likewise; the stalks when pulled up with the roots become foul, and consequently unfit for the above purposes.

For broken-winded horses bean-stalks are considered an excellent restorative.

We understand, on the authority of an extensive corn merchant in Glasgow, that the beans grown in the county Wexford do not bring within five shillings of the price of those grown in the carses of Scotland, from the nature of the seed, which is a degenerate species of the long-pod.

After being bound in sheaves with bands, and placed in stooks or shocks as the local phrase may be, the crop is taken to the stack-yard, and put up there on stands, like corn. The average crop, even with bad management, is about 7 barrels, of 20 stone, to the statute acre, and its culture ought to supersede the naked fallow system still perseveringly pursued, in many places, where the land is not so extremely stiff as to require this uneconomical process.

Colonel Dalrymple, in his treatise on the culture of wheat, recommends the planting of Mazagan beans with wheat, where a partial failure of this grain occurs.

> "On strong soils, but more particularly on clover lays, where wheat is thin, or has partly failed, planting Mazagan beans amongst it, is a matter of great importance, by ensuring to the farmer a certain produce from his land. Beans, from the construction of the plant, separate the particles of earth by their roots, attract the moisture of the atmosphere by their leaves, and thereby meliorate the soil, which is advantageous to the wheat during its growth, provided the roots of the bean do not interfere with the wheat. Wheat outstrips Mazagan beans, and I found where the wheat was thickest the bean was rather weak, but the wheat did not suffer in any part of the field, and was nearly the best wheat I grew this season."

The most frequent disease of the bean is a kind of rust which grows upon it as on wheat.

BEECH—Though very ornamental in lawns, from the great size which it attains, and the beauty of its branches, is far less desirable for the farmer's purposes, in hedge-rows, than ash or elm; it grows freely, however, in exposed and dry gravelly situations, and is useful for shelter, as well as for the purposes of millwrights and turners, the timber being serviceable for ladles, trays, bellows, bowls, &c. &c. The nuts, or beech-masts, as they are generally called, yield oil, if pressed, and are excellent for feeding swine. In Germany pigs are turned out regularly every morning to feed in woods and plantations, on the nuts and acorns which the trees have yielded, and their flesh becomes, in consequence, exceedingly firm.

BEES—Naturalists enumerate many classes of these, but the common hive, or domestic honey bee, is the species with which we are concerned.

There are three ranks, the queen bee, the workers, and the drones.

"First of the throng, and foremost of the whole,
One stands confest, the sovereign and the soul."

The queen—who from her birth is both sovereign and mother of the hive.

Having passed through the successive stages of *egg*, *larva*, and *nymph*, her majesty (having been, during the few previous days of her nonage, carefully nursed within her royal apartment, and fed upon pungent jelly, by a select body of guards from the workers) emerges on the sixteenth day, a mature and perfect queen, and about the fifth day afterwards, fulfilling the office for which she was designed, having led a swarm and passed a day in her new hive, she soars high in the air, at the time of day when heat has induced the drones to issue forth; and it is ascertained that love is the motive of this the only distant journey which a young queen ever makes; from this aerial voyage she returns in about half an hour, with evident marks of fecundity.* Huber has proved all this by numberless experiments, and supposes that the existence of so many drones in the community, (from 1200 to 2000,) is for the purpose of affording to the queen a certainty of meeting some of them in her excursions through the vast expanse of atmosphere which she traverses on the occasion just stated; and that great naturalist concurs with Linnæus in supposing, that the union is fatal to one or more of the males; in 46 hours afterwards, she commences the laying of eggs, of which she deposits from 12,000 to 20,000 in the next two months. If this flight and the impregnation of the queen be retarded beyond the 20th or 21st day of her existence, she will lay only drones' eggs,† either in the first season, or at any future period of her life; but if fecundated at the proper day, she will lay workers' eggs for two months, after which, she deposits those of the drone. A single interview with the male suffices to fecundify all the eggs which she lays in the course of two years, nor is it a less surprising fact that the queen would be barren if she remained always within the hive; though surrounded there by a seraglio of drones, she must soar in the air to be rendered fertile, nor does she receive due respect from her subjects unless she become so.

The homage and affectionate regard yielded by every member of the community to the sovereign is equally wonderful and interesting: her right of sway once acknowledged, her influence is unbounded.

But sometimes, to ascertain the right of sovereignty within a hive, a desperate contest arises; if there be two or more native princesses in a hive, (after migration has ceased, and there is no chance of founding another colony,) their royal highnesses fight until one only survives—the workers standing round to keep a clear space and see fair play. The royal antagonists, however, notwithstanding the magnitude of the stake for which they contend, are usually cautious and unwilling to stab each other, as if instinctively aware that the ejection of the lance (which is longer, stouter, and more bent than in the other ranks of bees) is usually fatal to her who ventures to throw it, as well as to the recipient; yet they sometimes allow the feelings of wrath to overcome the suggestions of prudence, and instead of separating, when there is danger of mutual destruction, fight "to the death." Doctor Bevan gives the following account of Huber's experience upon this point:—

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* See Bevan's History of the Honey Bee.

† The first *great* laying continues from the beginning of March to May, there is another great laying in August, and the laying ceases altogether about the end of October.

> "Two queens in one of his hives having left their cells at nearly the same instant, rushed together with great apparent fury; the antennœ of each were seized by the teeth of the other, and the head, breast, and belly of both were mutually opposed. Finding themselves, however, thus dangerously situated, and their curved extremities on the point of meeting, each disengaged herself and flew away; when the other bees, who had before receded to make a clear arena for the combatants, drove them together again. This was done repeatedly, till at last the stronger queen, seizing the other's wings, and curling her extremities under her belly, inflicted a mortal sting."

This sting is exceedingly sharp, as appears from a passage in Hook's Microcosm:

> "Upon examining the edge of a very keen razor by the microscope, it appeared as broad as the back of a pretty thick knife—rough, uneven, and full of notches and furrows, and so far from any thing like sharpness, that an instrument as blunt as this seemed to be, would not serve even to cleave wood; an exceedingly small needle being also examined, the point thereof appeared above a quarter of an inch in breadth; and not round, nor flat, but irregular and unequal, and the surface, though extremely smooth and bright to the naked eye, seemed full of ruggedness, holes, and scratches; in short, it resembled an iron bar out of a smith's forge. But the sting of a bee, viewed through the same instrument, showed every where a polish most amazingly beautiful, without the least flaw, blemish, or irregularity; and, indeed, with a point too fine to be discovered; yet this is only the case, or sheath, of instruments much more exquisite contained therein, as before described."

Instances are given of the imprisonment and starvation of the rival or stranger queen by order of the queen regnant, whose guards, surrounding the cell of the prisoner, have either starved her to death, or suffocated her by pressure.

> "The queen is very numerously surrounded when depositing her first eggs in the cells, her attendants then cling to one another, and form a living curtain before her, so completely impenetrable to our eyes, as to preclude all observation of her proceedings; unless the apiarian makes use of the leaf-hive of Huber, or the mirror-hive of Dunbar, it is hardly possible to snatch a sight of her, excepting when she lays her eggs near the exterior parts of the combs; the manner in which bees attach themselves to each other when forming a curtain, or when suspending themselves from a bough, or taking their repose, is, by each bee with its two claws taking hold of the two hinder legs of the one next above it, thus forming, as it were, a perfect grape-like cluster, or living garland. Even when thus intertwined

> with each other, as Swammerdam has observed, they can fly off from the bunch, and perch on it again, or make their way out from the very centre of the cluster, and rush into the air; this mode of suspension, so voluntarily adopted, must be agreeable to them, though the uppermost bees evidently bear the weight of all the rest. Mr. Mildman supposes that they have a power of distending themselves with air, like fishes, by which they acquire buoyancy.
>
> "An opportunity of beholding the proceedings of the queen is so very rarely afforded, that many apiarians have passed their lives without enjoying it; and Reaumur himself, even with the assistance of a glass-hive, acknowledges that he was many years before he had that pleasure. Those who have been so fortunate, agree in representing her majesty as being very slow and dignified in her movements, and as being constantly surrounded by a guard of about a dozen bees, who seem to pay her great homage, and always to have their faces turned towards her, like courtiers in the presence of royalty."

The origin of the supplementary queens is accounted for from their having passed the vermicular state in cells contiguous to the royal ones, and from their having at an advanced period fed upon some portion of the stimulating jelly designed for the nourishment of the royal *larvæ.*

When deprived of their queen, bees have the power of converting one of the grubs of the workers into a queen, by throwing two or three cells into one (their almost senseless inmates being first destroyed) and feeding the chosen grub with the pungent jelly. The queen is easily distinguished from her subjects by the form, size, and colour of her body; she is considerably longer, and her wings are much shorter than those of the others. The wings of the workers and the drones cover their whole bodies, those of the queen scarcely reach beyond her middle, ending about the third ring of her belly; her head is rounder; her hinder part is more tapering than that of the other bees; her legs are yellow, and her upper parts of a much brighter black than theirs. The *workers* truly deserve their appellation, for they furnish examples of patient and persevering industry, and of willing obedience to the *authority* of their sovereign, which may well put to the blush many communities of men.

The working bees are *sterile females*—though there are some rare instances recorded of individuals depositing eggs. It was long supposed that they are *hybrids,* or mules, but observation has enabled naturalists to ascertain that these industrious animals are of the female gender, though somewhat imperfect in their several organization. They are the smallest (though infinitely the most useful) of the community.

There are, on an average, 16,000 of these in a hive, and on them devolve all the occupations and labours of rearing the young, storing provisions, forming cells, providing the materials for, and working the wax and honey.

> "In the construction of their combs they afford the most striking proofs of an intelligent cause, as well as of a unity of design in the world. Their work is among the most remarkable of all facts in both these respects. The form is in every country the same—the proportions accurately alike—the size the same, to the fraction of a line; go where you will, and the form is proved to be that which the most refined analysis has enabled mathematicians to discover, as of all others the best adapted for the purpose of saving room, and work, and materials. This discovery was only made about a century ago; nay, the instrument that enabled us to find it out, the fluxional calculus, was unknown half a century before that application of its powers. And yet the bee has been for thousands of years, in all countries, unerringly working according to the fixed rule, choosing the same exact angle of 120 degrees for the inclination of the slides of its little room, which every one had, for ages, known to be the best possible angle; and also choosing the same exact angles of 110 and 70 degrees for the parallelogram of the roof, which no one ever had discovered until the 18th century."*

We may instance among the other surprising illustrations of the ingenuity and precision of these wonderful creatures, that they lay the foundation of their cities at the top of the hive, and build downwards. Their attics and basements change what *we* should consider their proper places, without danger of falling on the inhabitants.

Nor is this inversion of the usual order of building—this commencement apparently at the wrong end—by any means peculiar to *Irish* bees, it is a universally established rule in the architecture of bees.

The arcades which intersect, and yet unite, their critically parallel and uniform streets, are also evidences of the instinctive ingenuity of these agents of the divine power.

Writers are not agreed as to the age of the working bees, some maintaining that they are annual, others supposing that they might live many years. We have been assured, on good authority, that Adam Creighton, Esq. agent to the Marquis of Bute, had, at Lochnorris, a hive for thirteen years, which had yielded three swarms in each successive year, and without any winter-feeding whatever; be this true or false, bees may be rendered prolific and profitable to a great extent by careful and judicious treatment. It is well known that great numbers of bees die every year from hard labour, and though some of them may be preserved in successive hives or colonies for a longer period, the most accurate observers are of opinion that their ordinary age is, at the longest, not more than two summers. The usual practice of smothering is, perhaps, the most humane and best, as a life of debility and protracted misery is hardly desirable for beings who rarely enjoy existence after a season.

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* A Discourse of Natural Theology, by Henry Lord Brougham.

The drones, which take 24 days to attain the form of a fly, as naturalists assure us, are of no use, except for attendance on the queen, as already intimated; and after the swarming season, these unfortunate creatures are, one and all, massacred by the workers, who sting them to death.

But by a wonderful instinct they are allowed to live, if the hive be without a queen, or if the queen's impregnation has been retarded, or if there be no proper queen, and only fertile workers; evidently, according to Huber's theory, for the chances of being required to propagate the species during the natural season, after which they are invariably destroyed.

It is, however, far from certain, in our judgment, that the Creator (who makes nothing in vain) should call into existence, in each hive, from 1500 to 2000 of these inactive and cowardly members, who consume the food collected by the workers, when a very *small* number would suffice for the purpose of continuing the species; it is at least probable—notwithstanding the highest authorities to the contrary—that these citizens are in some way useful in the hatching of the eggs, or, (as has been conjectured by Shirach and Bonnes,) perhaps, in keeping the necessary degree of warmth in the hive, while the workers are collecting honey.

The drones are much larger than the workers, are blunt at the tails, and devoid of stings.*

Bees begin to swarm early or late in May, according to the weather, and give symptoms of their intention, by hanging in clusters outside their hives, and by the drones appearing much abroad, and by staying at home, even though the weather be tempting for rambling in the fields. Just before they migrate for the first time, there is profound silence, and the queen regnant leads them, as a matter of course, but in succeeding swarmings much noise is heard, arising, as is conjectured, from a dispute between the younger and rival queens and their respective partizans; when the point of precedence is settled, a queen goes out with the colonists, and the remaining queen or queens will continue in the hive, either to lead succeeding swarms, or to occupy the vacated throne. If it should happen that two queens accompany the swarm, either the swarm divides itself into two, taking distinct destinations, or a combat between the rivals decides on which the empire is to devolve; sometimes, indeed, they appear not to perceive each other, and the parties belonging to each construct separate combs within the same hive, but no sooner do these combs come in contact, and thus give occasion to the meeting of the queens, than the contest begins, and only terminates when one of them is killed. If from weakness, or other unpropitious causes, the queen who had led a swarm returns to the hive, she is immediately followed by her new subjects; but if the weather be fine, the probability is, that the migration is only deferred for a day or two; if the return be occasioned by the loss of their queen, the young swarm waits a fortnight or longer, before the attempt to migrate is renewed; and as the number increases, it is believed that they have waited for the maturity of the queen destined to the next succession; when swarms fly too high, or refuse to settle, they may be induced to descend by throwing water or sand about them; making a clatter with a frying-pan, or other metallic instrument of noise, (according to Virgil's hints, to "raise a din and shake the cymbals,") rather tends to send them to the parent hive.

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* Many species of foreign bees have no stings. In Australia the native savages catch the bees frequently, and suck the honey out of their bodies.

In hiving a swarm, the usual mode is to agitate the bees, if they cluster* on a convenient branch, into a hive placed on a cloth on the ground; they sometimes swarm on very high boughs, in which case, while one person mounts the tree with a pole in his hand, another mounts a ladder placed against the tree, and holds a hive under the bees, whilst his companion sweeps them into the hive, or if the bough be slender, cuts it off and lets it drop into the hive. If they take up a position from which they cannot in this way be dislodged, rags should be burned to smoke them out, or the juice of wormwood or elder be rubbed upon the bough. When they occupy a hole in a wall, or the hollow of a tree, (and descendants from the *same* stock have been known for years to take possession of particular spots, as if some of the senior bees accompanied the juniors, and from *memory*, conducted them thither,) it may be necessary to carry their quarters by assault at night, by enlarging the breach from without, placing the hive under it, and then scooping them out with a ladle.

At the time of swarming, unless there be wind or some other irritating cause, bees have no disposition to sting. Swarms after the middle of June, if small, should be put together, even though they do not rise on the same day, for by combining them, they will work more industriously, and be better able to resist their enemies. The easiest method of uniting them is, by laying a stick across a cloth, placed at night upon the ground close to the hive in which the two swarms are to be lodged, and then placing the hive with the newer swarm over the stick; if a smart stroke then be given on the top of the hive, the bees will drop down upon the cloth in a cluster; this done, and the empty hive thrown away, the other hive should be taken from its stand and set over the bees, who will soon ascend into it, and mix with those already there, and become one and the same family; or if the hive into which the younger swarm has been put, be placed with its mouth downwards, with the other hive over it, the fresh swarm below finding themselves turned upside down, will soon mount into the upper one. One queen only must be left alive, and by catching and placing her in a hive, her subjects will soon settle with her.

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* Clustering is effected by means of two hooks terminating each foot by which they hang from each other.

A swarm often leaves its hive, and even after alighting and clustering will return thither, but this only occurs when the queen did not come with them, probably from want of courage, or strength of wings.

Mr. Tighe, in his Statistical Account of the county of Kilkenny, gives the following observations on the management of bees in winter:

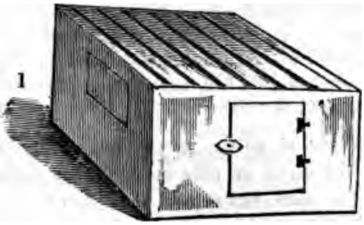
> " The hives are usually placed upon stones, which are injurious to bees in winter by being too cold, and in the summer by being too hot. No mode but that of smothering has been adopted for taking the honey; but the Rev. Doctor Butler, of Kilkenny, has introduced a method of preserving bees during the winter, which, from its facility and success, may perhaps become more common: he tied them up in a cloth, with a round board under the bottom, and hung them in the dark, from a collar beam of a house, in the beginning of October; he released them on the first of April, and the fine hives which he treated in this manner were strong, and apparently in better health than those treated in the usual way. At the bottom of one hive there were about one hundred dead, and above thirty in each of the others; a great many more would have perished in the common way, and at any season, this mortality, in so great a number, would be extremely small; as it entirely saves all the winter food, and preserves the insects also in the best manner, there can be no doubt of its being the safest and most profitable way of keeping bees.
>
> " The Abbe de la Bocca, in his treatise, mentions this also as a common practice in many parts of the Turkish empire, and if it succeeded with him in an island of the Archipelago, it ought to answer better in a colder climate. Care must be taken to keep them remote from noise, and without light, when, like ants in this country and most other insects, they will become insensible during the cold weather, which appears their most natural state in all northern countries."

The experiment of *interring* bees in their hives, during winter, at a depth of four or five feet, has been successfully tried; we are not, however, sufficiently familiar with this practice of burying alive, to recommend it.

> " To destroy the bees in taking the honey, seems a barbarous and awkward custom, when the structure of hives by Wildman and other persons has been so long known, when bees can be made with ease to fill several separate hives, of which the proprietor can take such as he pleases. Wildman's hives are flat, seven inches in height, and ten in depth; in the upper row of straw are fastened small bars, to which the bees affix their combs, over this is a flat cover of straw; in a short time after the bees have hived, a second flat hive may be put under, and as soon as they appear to want room, which will be in less than three weeks, a

third ; a few days after, the top may be taken away, and will be found full of honey in good seasons ; they will fill five of these hives, and the two last will be found sufficient for their own use, and more, if they are hung up in the winter. The process is extremely simple, and certain of success with hives of a proper size ; it has succeeded with me even with a large common hive. When a hive appears full, it is not uncommon for the country people to put a riser under it, for the bees to continue working in, which is a step towards a better practice."

For preserving bees from season to season, and obtaining successive supplies of honey, the most approved hives are flat, having wooden tops fixed on with wires, the inside twelve or thirteen inches in the clear, and about seven inches high ; the top having a centre hole, and three or four others round it, near the outside, each hole being two or three inches in diameter, and fitted with bungs ; if swarms be not wanted, a large *glass*, or small straw hive may be put on the top, about the end of March ; or a small glass to each hole, previously pulling out the bungs, gently turning them round first ; each glass having a bit of paper pasted on it, stating its weight when empty, and kept from the light by an empty hive placed over it. Every ten or twelve days they should be examined, and, when filled, removed, and others put on as the season permits.



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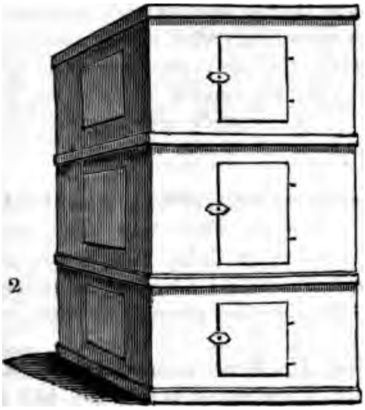

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The annexed plate, No. 1, is a sketch from Dr. Bevan's treatise, and represents a single bee-box, twelve inches square, and nine inches deep, with six wooden bars, three quarters of an inch thick, an inch and half wide, and with intervals of half an inch between them ; at the back there may be a pane of glass fixed in a small rabbet, and also another little pane in one of the sides, through which the strength of the stock of bees, and their stock of honey, may be ascertained.

No. 2 shows the storifying boxes, placed in tiers. Some recommend that the empty hive should be laid above, and others contend that it should be placed below the full one. As bees have an instinctive disinclination to work upwards, it is better to indulge their natural bias, by placing the box into which it is desired that they should be lodged, beneath that which they are to vacate.

> "Each set of boxes must have one *close cover*, which should be an inch thick, and well clamped at each end, to prevent warping, as a considerable quantity of steam arises from the bees at certain seasons. The top, being intended to take off and on, should be secured by means of four screws, each placed about an inch and a half from the respective corners; and it should also be fitted to, and screwed down upon, all the boxes before any of them are used, and whenever it may be necessary to remove, or to add a box, the change may be effected with the utmost promptitude. Long taper screws, as nearly of the same size as possible, should be selected for fastening on the tops, and be dipped in grease before put in, to facilitate their removal. Each set of boxes must also have a *loose floor*, an inch thick, and extending about an inch and a half beyond the back and sides of the boxes. The outlet for the bees is usually cut in the lower edge of the boxes, but I have found it much more convenient to have it formed by sinking the floor half of its thickness at the centre of its front edge. The width of the part sunk should be about four inches, and should gradually diminish in depth till it reach the centre of the board. The sloping direction thus given will, in case of beating rain or condensed steam falling upon it, prevent any wet from lodging within the hive. The floor must also be clamped at the ends, to prevent warping, though the superincumbent weight renders it less liable to be warped than the top. Either on the right or left hand side of the entrance, as may be most convenient, a *groove* must be cut half an inch deep and half an inch wide; to this groove a *slide* must be fitted (made to run easily) for the purpose of closing the box, and preventing the egress or ingress of the bees, as occasion may require."

If a stock be weak, a new swarm, or a cast, may be put on the top of it, and the entrance closed till eight or nine the following night. These stocks may be preserved for years, but should be kept in a house or shed; and when the winter begins, the bungs having been replaced, the hives should be covered over with sacking, or other warm materials; glasses may be put on a swarm immediately after hiving, removing them in three or four weeks, to enable the bees to procure food enough for the winter; by pursuing this plan, any number of stocks may be kept, and the bees saved; but it is *essentially* necessary that the glasses, or empty hives, be placed on the stocks very early in the season.

The best mode of guarding against the stings of bees, when attending to their first hiving, is to cover the whole head, neck, and shoulders, with thick gauze, or muslin; this being kept by the hat from pressing against the face, will allow the *bee-herd* to see clearly what he is about; he also should have woollen gloves, and boots, or gaiters.

For feeding the stocks in winter, Dr. Bevan recommends the following compound—"a pound of coarse brown sugar, and half a pound of ale, or sweet wort, boiled to the consistence of a syrup, to which may be added a little salt;" and his rule is, that if the spring be unfavourable for gathering early, and less than ten pounds of honey per stock have been left for their winter's support, and the winter have proved mild, the bees should be fed early in the season, and sometimes through a considerable part of the month of May. If they be fed in winter, the simplest mode is to put the syrup into a saucer covered with gauze, or reeds, to prevent the bees from adhering to it, and to lay it in the evening on the floor of the hive—they will remove it gradually to their cells; when empty, the vessel should be removed. In spring, as long as the weather prevents the bees from supplying themselves from the spring blossoms and flowers, they should be fed. The same apiarian, from whose valuable work we have so largely drawn, recommends a daily supply of food, as it may be actually wanted. This is usually introduced through an elder-stem scoop.* The entrance to the hive should be closed during feeding time, to prevent marauders of any kind from annoying the inmates.

As the great supply of their food is obtained by their own exertions, no farmer, or even humble cottager, who has a patch of garden, or lives near the woods, and dry hills covered with heath and herbs, in which bees delight, should be without stocks. It is not the rarest, and most beautiful flowers which afford the best honey, but those which abound in the open fields, as well as in the garden; the flowers of mountain-heath, clover, trefoil, beans, vetches, wild thyme, turnips, and cabbages, privet, elder, bramble, broom, and above all, the blossom of the common furze, are amongst the best materials for honey. In order to obtain abundant supplies of those natural flowers, which give the most exquisite flavour to honey, it is a common practice in parts of Scotland—on the Mearns and Egglesham moors, for instance—to remove bees in August from their garden quarters to the heathy pastures, and to bring them back again before winter. Their removal is effected by placing the hives, early in the morning, or at night, on boards laid on hand-barrows. Hives are sometimes carried a distance of twenty miles, for the mere purpose of obtaining change of food and heath flowers.

The object of those who are thrifty enough to keep bees, should be, to have in the neighbourhood of the hives, those shrubs, or plants, which are early and late in blossoming, from the gooseberry and currant tree, to the ivy, which is one of the latest in bloom.

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* This mode is by means of a little simple machinery, to place the syrup in a small apartment, to which the bees are admitted by withdrawing a slide; the shallow saucer which contains it, is covered with Scotch gauze, fastened with a needle and thread upon a hoop of whalebone, fitted to the inner edges of the saucer, through which the bees suck up the syrup, without smearing their wings.

The cost of rearing bees, compared with the pleasure or the profit, is nothing. Enormous sums are annually paid in Great Britain and Ireland for bees' wax, imported from foreign countries. In the year 1830, £60,000 was paid by England for bees' wax, imported from Africa; and probably three times that sum for the same article, imported from Holland, France, and Italy. It is lamentable, as it is unaccountable, that our small farmers and cottagers should be so indifferent to the propagation of the valuable and interesting beings which yield it.

The following will be found an effectual mode of preserving honey: let the combs be laid on close-barred sieves, placed over earthen preserving pots until the honey has trickled into them. Put these vessels into a pot of water, on the fire, until the water begins to boil, then remove the pot from the fire, leaving the pans of honey in it until they become cold. If the honey be then covered closely with paper, tied down, it will keep for a considerable time, without becoming candied or congealed.

BEET—The species called cattle beet, or mangel wurzel, to distinguish it from the garden beet, is probably a hybrid between the two, and was introduced into England, from Germany, about half a century ago, under the name of mangold würtzel; this—we mean the word, not the vegetable—is a tremendous mouthful, and we heartily wish to substitute the English term cattle beet, which we can pronounce without any unusual effort of the jaw. Of the cattle-beet there are two sorts, the red, and that which is yellow internally,—the former is best known and most approved, although the latter contains more saccharine matter. Beet is a valuable root for milch cows, and for fattening cattle; but as it requires rich loam, well manured with short rotten dung, turnips or potatoes are far preferable, as they will grow pretty freely on inferior soils, and with a much smaller allowance of manure. The best mode of sowing it is as follows: after the land has been well prepared, as for turnips, let drills be opened at the end of March, or the beginning of April, (unless there be danger of frost and harsh weather,) at intervals of 26 inches; fill these drills with dung, then cover them, with a double or single mould-board plough; afterwards roll the drills, when closed, and then with a stick, draw a little furrow on the centre of the closed drill, from half to three quarters of an inch in depth, according to the heavy or light nature of the earth, and in this furrow, let women or boys drop seeds, previously steeped for some hours in soft water to promote quick vegetation, at intervals of five or six inches; then cover the seed by drawing a rake along the little drills. This mode is better than the usual one of making holes with a dibble, for in this case, the work-people sometimes omit to put even a single seed into the holes, or put in too many seeds; and if the earth be naturally tenacious, it is apt to harden about the holes; and in drawing out the supernumerary plants, when they attain sufficient strength, the fibres of those left standing are frequently injured by the act of separating the others from them. Two pounds of seed are sufficient for a statute acre, if it be fresh, which should always be sought; after the plants are well up and strong—about the size of early carrots, when brought to table—they may be thinned out permanently to the distance of 10 or 12 inches, if circumstances give reasonable expectation of a luxuriant growth.

Mr. James Macklin, an able and experimental gardener, has stated, in the Irish Farmer's Magazine, an improvement on the ordinary mode. The drills being manured and covered as usual, he says—

> "The horse-hoe, and afterwards the drill-harrow, should be set to work when weeds grew up, to clean between the rows and to lessen the soil, taking care to clear the earth away from the crown of the plants: weeds should be taken out with the hand-hoe, or finger and thumb. After three weedings at most, the overshadowing of the leaves will keep the land clean. It may be sometimes desirable to transplant cattle-beet, either to replace failures, or after early potatoes; but transplanting rarely succeeds perfectly; when it is pursued, the plants for removal should be as thick as a walking stick, and have some fresh dung applied to the roots, else they will be very dwarfish in size; the produce of an Irish acre has been sometimes 80 tons, the plants averaging between 5 and 6 pounds each; we have frequently had them double this weight, and have seen one which weighed 26½ pounds, clear of leaf and fibre. We are not, however, to calculate too favourably in consequence of such singular productions; 40 tons' weight to the statute acre may be taken as a fair average on well prepared land, and this is far superior to any kind of turnips, except the Swedish, in nutritive properties, and more than double the weight of the largest crop of potatoes that can be raised."

Beet never injures the flavour of milk and butter, as turnips and potatoes unquestionably do; but as to its fattening properties there are differences of opinion. Lord Althorpe, however, tried an experiment on this point, and gave the report as follows—

> "I tried an experiment, by feeding two oxen abundantly on Swedish turnips and mangold wurtzel, and the result was, that they increased in weight, each of them, when upon mangold wurtzel, much more rapidly than when upon Swedish turnips, in proportion to the weight which they consumed. I next year tried the same experiment on a single beast, and the result was similar, but rather more favourable to the mangold wurtzel."

Beet should not be given in large quantities, at first, to cows, as it relaxes their bowels, and salt should be occasionally scattered on it; four stone per day will be a good allowance for a milch cow, and double this quantity for an ox or large cow, when fattening. Pigs eat it greedily; but it is rarely given to horses, though doubtless good for them, when boiled, or steamed; it is said to improve the flesh of hogs wonderfully, if they be fed with it until within three weeks of their being killed, during which time they should be fed with corn, or other hard food, (see *Swine.*) From the middle of September to the first of November, the leaves are valuable for milch cows and pigs; and at the latter period it should be either housed, or piled near the cow-byres, in oblong heaps, and well covered with straw, or it may be left in the field, preserved like potatoes in heaps, covered with straw, and a layer of earth over it, to guard it against frost.

Beet has long been cultivated in France for sugar manufacture, and in some parts of Great Britain it is used for the same purpose. It requires a mild, if not a warm climate, and will probably be found so unsuited to the northern parts of Scotland, where Swedish and Aberdeen turnips succeed well, as never to supersede the latter in that country. In the south of England it is a very valuable crop for any of the purposes for which it seems designed.

BIRCH—Flourishes on either wet or dry ground, in high or low situations, where no other tree will grow; it is good for roofing cabins, and will last a great many years, if properly covered from the weather; it is not, however, to be considered a desirable timber, and is only applied to making chairs, tables, &c. &c. and those purposes for which durability is not essential.

BLIGHT, or BLAST—Arises from cold, easterly, or frosty winds in spring, nipping the buds, by checking the circulation of the juices, which are so essential to the nourishment of plants; when the current of the sap is thus stopped, the vessels which contained it swell and burst, and the leaves wither away. This sap, diverted from its natural purpose, frequently becomes the recipient of the eggs, and subsequently the food of innumerable insects, which, though by ignorant persons supposed to cause blight, are in reality the effect of it. Premature spring vegetation is, therefore, always to be dreaded.

Blight is also a summer disease, especially affecting wheat, when in full growth; in this case it is occasioned by short heavy showers and vapours, immediately succeeded by hot sun.

There is also a third cause of this disease, (which is to be distinguished from red-gum, mildew, honey-dew, or gangrene,) namely, the attacks of fungi (see *Fungus*) upon the leaf or stems, giving the appearance of rusty powder, like that contained in a fairy-cap, or puff-ball, which comes off on the slightest touch; the seeds of the fungi, as they float in the air, enter into the pores of the leaf, or it may be, having existence in the soil or its manure, invade the root. If this red covering be not what is termed red-gum—which is often accompanied by a maggot, and attacks the ear only—the corn recovers when washed clean by rain. The flower of sulphur is said to be in some degree a remedy for any partial blight. Experience has proved that the kind of blight which is accompanied by red-rust, occurs most frequently (perhaps under no other circumstance) after very mild, open winters. The action of frost on the ground, by destroying the eggs and larvæ of insects, removes at least one predisposing cause of the diseases of corn and other crops; good tillage, too, is a powerful preventive of their maladies.

BOGS—Their formation is thus accounted for:

"Many peat mosses seem to have been founded by the destruction, in consequence of the imprudent use of the hatchet by the early cultivators of the country in which they exist; when the trees are felled in the outskirts of a wood, those in the interior are exposed to the influence of the winds, and having been accustomed to shelter, become unhealthy and die, and their leaves and branches gradually becoming decomposed, produce a stratum of vegetable matter. In many of the great bogs of Ireland and Scotland, the larger trees that are found in the outskirts of them, bear the marks of having been felled; in the interior few entire trees are found, and the cause probably is, that they fell by gradual decay, and that the fermentation and decomposition of the vegetable matter was most rapid, when it was in the greatest quantity. Lakes and pools of water are sometimes filled up by the accumulation of the remains of aquatic plants, and in this case a sort of spurious heat is formed; the fermentation in these cases, however, seems to be of a different kind—much more gaseous matter is evolved; and the neighbourhood of morasses in which aquatic vegetables decompose is usually aguish and unhealthy, while that of the true peat, or peat formed on soils originally dry, is always salubrious."*

"Peat, it is said, consists of vegetable matter which has undergone a peculiar change; under a degree of temperature not sufficiently great to decompose the plants that have sprung up upon the surface, these plants accumulate, and aided by a certain degree of humidity, are converted into peat, which is found either in strata upon the surface of plains, or accumulated in great beds on the tops and acclivities of mountains, or in valleys, hollows, and ravines. Successive layers of plants being added to the mass, it continues to increase, under circumstances favourable to its production. Water is a necessary agent in its formation, and we may believe, too, a peculiar temperature, since it is only in the cold and temperate, and not in the warmer regions of the earth, that it is found to be produced. The plants which form it have not entirely decayed, but still retain their fibrous texture, and from the action of certain natural agents, have acquired properties altogether distinct from those which, in their former condition, they were possessed of; they have now formed a spongy, elastic, inflammable body, and so different from the common matter of vegetables as to be highly antiseptic."†

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* Sir Humphry Davy.

† Professor Low.

Every wild, ill-cultivated country in the North of Europe has abounded with bogs. History informs us that the Gauls, Germans, and Britons, as well as the Irish, retired, after being defeated in warfare, to their *paludes*, which probably were what we call bogs or mosses. The quantity of bog in Ireland is little less than three millions of acres, of which one half is flat; the remainder is the covering of mountains. The want of industry has occasioned them; for if the trees, around which the peat matter was formed, had been removed, and drains cut for the escape of the water—the prime agent in the formation of bogs—the soil would have been preserved in its original state, and these morasses would have been unknown. The expense attendant on bog draining, on a great scale, being very considerable, the speculator will be prudent in attending to the judicious caution of Mr. Blackadder, of Stirling:

> "Whatever may be the nature of moss, it is on all hands agreed, that no improvement can be made without draining; yet it must be a primary consideration whether, under all the circumstances, the expense even of draining would be well bestowed."

He mentions some very essential points to be regarded previously to embarking on the speculation of draining a bog; among them—the nature of the sub-soil—the comparative thickness of the moss strata—the state in point of humidity and capacities for drainage.

It being obvious that the sub-soil was the surface, before the formation of the bog, it is material to ascertain its nature; for if it be calcareous, or earth of a good quality, it may be both desirable and practicable to float off the superincumbent matter, as has been done in the vale of the Forth in Scotland. If it be too solid or too deep for this operation, yet not of considerable depth, it should be pared and burnt down, until the sub-soil—sometimes shell marl—is reached.

Mr. Blackadder gives some criteria by which to judge of the qualities of bogs or mosses, as they are termed in Scotland:

> "Mosses composed of reeds, (*Arundo*,) Horsetail, (*Equisetum*,) Trefoil, (*Menyanthes trifoliata*,) Sedge, (*Iris*,) Rushes, (*Tuncus*,) &c. more readily decomposed, form a much richer soil than either of the former," (referring to slow mosses, the produce of Sphagnum, (*Bog moss*,) Hypnum, (*Feather moss*,) &c.)
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> "Nothing so well determines the quality of moss as the plants which it spontaneously produces; for the moss soil and its products are nearly the same substance, and the crop of the preceding year is the soil in which the next year's crop vegetates. Again, the moss plants now vegetating indicate the degree of moisture; for so soon as a permanent saturation is effected, the sphagnum, &c. is produced, to the almost total exclusion of the other plants; but on the water being drawn off, it dies, and is succeeded by heath and sundry coarse aquatic grasses; or, if rendered sufficiently dry, bent-grass prevails. If decomposition is by any means effected, then rushes, and also the finer pasture grasses supplant the latter. While moss plants continue to grow, it is evident that the depth of moss must be still on

the increase, and this by means of the antiseptic qualities of its products; but where, by any means, pasture grasses, or even rushes abound, it is as manifest that the proper moss is in a state of decay; decomposition has commenced, and a very different soil is presented, and, of course, a different treatment is called for."

When bogs are very shallow, and have a good sub-soil, they are easily reclaimed, and become very valuable. Where they have been so far cut away as to leave merely a *residuum* of peat, the land, after being levelled by the spade—for in this case it is generally full of holes, from one to two feet in depth—should, if on a large scale, be *ploughed* very deep with a powerful plough, drawn by six able horses, for the purpose of loosening the sub-soil thoroughly, and bringing a portion of it to the surface. The small holder will find his account in *digging* deeply, and thoroughly mixing the soils; after which, if he can afford lime and dung, he may depend on excellent crops; yet vast quantities of land are left unproductive from want of the application of labour, though that labour is frequently unemployed with regularity on any other object. When the sub-soil is within reach of the spade or plough, stones are so easily thrown up to the surface, that there is abundance of material for making drains, after which the work of reclaiming proceeds in the ordinary way. Our object, however, in this article, is to treat of the *difficult* cases of bog culture, and to point out the modes most successfully adopted; but first, we must enter a little into the consideration of the *principles* on which the draining of deep and flat bogs should be conducted; but perhaps the language of Mr. Reid, author of an admirably written prize essay, "on the draining and cultivation of moss, and other waste lands," and the successful drainer of a greater portion of Chatmoss, in Lancashire—with the omission of intervening sentences, not exactly bearing on our point—will best express what we wish to convey:

"The great stumbling-block to the road to success, seems to have been the want of duly considering the *principle* by which the water is retained in mosses. In many instances much labour has been thrown away in endeavouring to cut wide and deep drains, at a considerable expense, under the impression that they would produce every desirable effect over a large extent of surface; but, without saying it is absolutely impossible, it may safely be asserted that it is very unprofitable, to attempt even to cut deep drains on white or flow moss; the semi-fluid character of this substance, in consequence of the quantity of water held in the multitude of capillary tubes, of which the vegetable mass is composed, causes a pressure upon the sides of any and every drain that is cut, and the pressure will be as the depth. The water, in fact, seeks to find the lower level, which has been created by the drain, but it is held in the moss by capillary attraction; a sort of conflict then ensues between the two principles, which in all cases, where the drain is made of an improper depth, ends in the water taking the moss along with it, as it were, and the two sides of the drain come together. Both principle and practice have taught and confirmed the author in the opinion, that the only effectual way of draining deep moss, is by inserting drains at small distances from each other; and that in order to effectually drain, and at the same time, to keep the expenditure within a proper compass, it is necessary to make the drains of as great a depth as the moss will conveniently allow, without removing more of the moss than is absolutely necessary."

It appears that Mr. Roscoe, "the pioneer of moss improvements in the county of Lancaster," fell into the error of imagining that wide and deep drains, *fifty yards* apart, would effect the object without under-draining; but these drains, after twenty years, were so squeezed together by the lateral pressure, as to be traced with difficulty. There is a disputed *principle*, whether injury may be done by over-draining; we think, with Mr. Healy Dutton and others, that the subsidence of the bog should be gradual, for if it parts with its moisture too fast, it becomes a dry, fibrous, inert matter.

"Considerable judgment is, indeed, requisite in constructing drains of a depth suited to the nature of the bog; for their object should be, to carry off the water from the surface *only*, but not to deprive the entire body of the soil of its moisture. Spongy and deep mosses, in particular, would be materially injured by being made too dry under the surface; as were there too great a depth of dry fibrous substance to receive the rain, it would be too quickly absorbed, and together with the effect of the summer heats, they would be entirely deprived of humidity, and rendered unproductive."*

Mr. Blackadder, already referred to, in direct opposition to this, asserts that

"There is no danger of overdrying moss by draining, but there is much danger of this being done by *trenching* to a greater depth than eight or nine inches."

With respect to the description of drains, he observes:

"No drain in any kind of moss need exceed four or five feet in depth, and for covered drains a depth of three feet is quite sufficient; these, being straight, and parallel to each other, and discharging into larger sub-divisional drains, and being distant from each other from twenty-four to forty-eight yards, according to the nature of the moss, will, in general, be found quite sufficient."

As to the practicability of reclaiming even the red bogs of Ireland, we have the authority of very scientific men.

Sir H. Davy says:

"A soil covered with peat, is a soil covered not only with fuel, but also with manure. It is the excess of manure only which is detrimental; and it is much more easy to destroy than to create it. To cultivate a bog is a much less difficult task than to improve a sand. If there is a proper level to admit of draining, the larger the scale of operation, the less must the comparative expense be, because machinery may for many purposes take the place of manual labour; and the trials which have been already made by private individuals, and which are stated in the different reports, prove not only the feasibility of the general project, but afford strong grounds for believing, that capital expended upon it, after mature and well digested plans, would, in a very few years, afford a great and increasing interest, and would contribute to the wealth, prosperity, and population of Ireland."

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* Burroughs on converting waste land to profit.

Mr. Nimmo says:

> "I am perfectly convinced, from all that I have seen, that any species of bog is, by tillage and manure, capable of being converted into soil, fit for the support of plants of every description; and, with due management, perhaps the most fertile that can be submitted to the operations of the farmer."

Mr. Griffith, in his report, gives the following extract from Mr. Arthur Young's tour, descriptive of an improvement made at Woodlawn, by Mr. French, fifty year's previous to Mr. Young's view of it:

> "This bog improvement has been made about fifty years. Seventeen years ago it was manured by a light surface dressing, composed of the scouring of bog-drains, together with lime-stone gravel, and some lime; it is now an excellent pasture for sheep and cattle, and has no apparent tendency to return to bog. The sod is so firm, that horsemen may ride over it without sinking in the least, or leaving any visible marks. The present depth varies from ten to eighteen feet; it must have been considerably more formerly."

We have recently seen instances of bog improvement in Ireland, on the estates of Lord Clonbrock and Mr. FetherstonH. which we hope to see followed up with spirit and energy by other proprietors. To these we shall now minutely refer, as furnishing the best practical details of management.

About three years ago, Colonel Burgoyne, of the Board of Works, J. L. W. Naper, Hugh M. Tuite, Charles Hamilton, and Charles William Hamilton, Esqrs. at the request of the Agricultural Society of Ireland, formed a deputation to inspect and report upon the bog improvements of Mr. FetherstonH. in the county of Westmeath; these gentlemen have submitted a report which ought to induce many other land proprietors to imitate the example which Lord Clonbrock and Mr. FetherstonH. have afforded.

After some preliminary remarks on the nature and extent of the Irish bogs, and their depth, which varies from three or four feet to forty-two feet, with an interesting reference to the draining away of the ferruginous and acid matter, and subsequent consolidation and fertilization of a bog, by the overflowing of a constant stream from the Slieveboom mountains; the introduction of wooden railways by Mr. Edgeworth, in 1782; the invention of the horse-patten by Mr.

Roscoe; and the use of iron-railways, and improved implements of Chatmoss, the report states:

"Mr. Fetherston commenced his work in the spring of 1832, upon the townland of Ratton, situated about 2½ miles west of Kinnegad, in the county of Westmeath. In external appearance the bog presented little to attract speculative enterprise, being of the wettest character, and utterly unproductive; a mere tract of black slime, studded with tussocks, hags, or little elevated islands, upon which stunted heath barely vegetates. In accompanying circumstances the district is more highly favoured, as it shares with almost every other bog in Ireland, the vicinity of lime-stone and lime-stone gravel. The lime-stone is met with in boulders. The lime-stone gravel deserves more attention, as it is either not found, or not generally known in either England or Scotland as an amendment; but it is both well known, and occupies a considerable place, in the agriculture of Ireland. It is a hard sort of calcareous marl, that assumes the appearance of small stones or gravel, which, when spread upon the ground, or mixed with it, gradually falls into smaller pieces, and fertilizes the soil in proportion as it breaks down, or mixes with it.

"With reference to agriculture, the bog may be divided into two classes, the high red bog, which forms the great mass, and which burns away, giving very little ashes—and the black peat, which is found on the low edges, and which, when burnt, gives a larger proportion of ashes, capable of being used to great advantage as a manure.

"Mr. Fetherston began by engaging the assistance of Mr. Reid, the able conductor of the improvements on Chatmoss; and procuring, through him, a considerable length of railway, with waggons and implements, such as were there found to be necessary, in order to restrain the outlay within such bounds as might secure an ample return of the capital expended.

"Mr. Fetherston, when he had his improvements planned out, was in possession of the requisite implements, and had engaged an English labourer from the works at Chatmoss, as an instructor of the others, commenced reclaiming an extent of about 50 acres.

"Open drains were then laid out at 66 yards apart; at right angles with, and leading into the main-drain, and leading into these open drains, were covered drains at 5 yards distance from each other.

"With respect to these open drains, Mr. Reid says—'No doubt you will find some difficulty in making them *stand* to the dimensions at which they are set out. But this must be borne with, and if they rise at the bottom, or press in at the sides, they must be cut again and again, (after a sufficient lapse of time,) until the water which is now in the moss is drained out of it.' When the drainage, thus so far effected, has rendered the sides of the drains more solid, they are sunk again, so as to be in the whole 3 feet 6 inches deep; and the workmen proceed to prepare the covered drains. These are marked out with the line, and cut with the tommy-spade to the dimensions of 14 inches wide and 2 feet deep. The sods are left at the sides to harden, and when this object is effected, the drain is cleared out, and a second cutting with the spade and scoop effects another opening at the bottom of the former one, 7 inches wide, and 1 foot 6 inches deep. The first, or upper sod, is then placed so as to rest upon the shoulders of the under drain, and the remainder of the sods are filled in over it; during these operations the workmen are obliged to wear pattens, in order to support them on the soft moss; it is hard work, and requires strong and well fed labourers.

"Mr. Fetherston's practice has hitherto been, to leave the cutting of the drains to be done by day's work; the anxiety in the men to prove themselves good workmen, and thus entitle themselves to promotion, being a sufficient stimulus to exertion; but there would be no difficulty in arranging the value of the work by the piece. Mr. Reid's opinion upon the effect of the industry thus encouraged, is worth quoting. He says—

"'It appeared to me, when last at Griffinstown, that although you had so raised the wages of the men, who worked upon the bog, 20 per cent., you got 50, or in some cases 100 per cent. more work done by each man per diem; here is a direct profit both to you and the men; and who will say where the incentive to exertion in others, which is furnished by this example, is to end?'

"The drainage having been thus completed, the next operation was to level any very great irregularities with the spade, and immediately introduce the plough to turn up the whole surface. The plough is made very light, of wood, shod with sheet iron; it is drawn by one horse, that has pattens affixed to his feet; the horse is easily trained to wear them, by turning him out to grass for a couple of days with the pattens on. When the plough has done its duty, it is followed by a roller, made of iron, with plates of thin iron, six inches deep, set at five inches apart, at right angles to the cylinder and wheels, which are taken off when the roller is used. This, passing backwards and forwards over the roughly turned up sods of turf, reduces them, and, as it were, minces them so fine, that no large clod is left. Then comes the use of the railway, each length of which consists of two iron bars connected by cross bars of round iron; the side bars are fastened upon triangular wooden beams, which enables them to rest upon the soft bog. The railway is laid from the place where gravel is to be raised, and which, of course, is selected, where the double purpose may be gained, of either sinking a main drain, or making some necessary excavation in the bog. The waggons are then placed upon the railway, and one horse draws about 3 tons; they are delivered at such a distance, as may enable the shovellers to distribute the gravel to a depth of about 3 inches for about 5½ yards on each side of the railway; which, when so far is complete, is moved 11 yards further on one side, and the operation continues until all is covered; if 12 waggons are discharged to every 24 feet of railway, it will take 1068 loads to the Irish acre. The plough is then used or not, according to circumstances. Mr. Reid says—

"'If you work the bog right well before you apply the gravel, there is no doubt you can do without ploughing afterwards, if it is to be sown with grass seeds. The object is to mix the bog and gravel, and so as that is done, and well done, it is no matter how; only the least troublesome way is the cheapest, and, therefore, the best.'

"The bog is then either laid down with grass seeds, or manured with dung or ashes, principally the latter, for a crop of potatoes followed by oats or bere. Mr. Fetherston's practice has been, to lay down immediately with grass, which he feeds off with sheep. The seeds used are chiefly Timothy, Cocksfoot, and Ribwort. Rape has been tried, but it was found to injure the after-crop of grass materially.

"This portion of the improved bog has been gradually consolidating. During the last year, one and half-year old bullocks have been fed upon it, without injury to the surface; and there is every reason to expect, that, in a little more time, it will prove as firm and solid as any of the surrounding land, at least as far the purposes of the grazier are concerned.

"In the next portion, undertaken in the spring of 1834, some considerable improvements were made. It was found that the bog could be drained from the surface as completely as by the system of covered drains, and thus a saving of labour, to a great extent, was coupled with a more lasting character of improvement. Open drains were laid out, at about 70 or 80 yards apart, and the intervening space was thrown into inclined planes, irregularly enough, as advantage was always taken of the natural lie of the bog; but in such a manner as that the water falling upon the surface should readily discharge itself over the surface into the open drains. This mode has proved perfectly successful; a fault too in the former mode was corrected.

"In the description of the bog it was mentioned, that the upper part consisted of tussocks, or little islands, with slime and stagnant water separating them from each other. When the whole was evenly ploughed over, and afterwards laid down, it was found that the grass failed upon the slimy part; there was no vegetable substance in it, in a state to amalgamate with the gravel. Now these soft places or surixes, are covered with the top sods taken from the open drains and irregular elevations, and thus the whole surface is rendered more uniform. Again, it was found better, when the bog had been prepared, as before described, with the plough and roller, to spread a thin coat of ashes, and immediately sow the grass seeds, and not apply the gravel until the following spring. It was found that the seeds sprung up more freely in the loose bog, and that the timely application of the gravel in the following spring prevented them from being burnt up by the sun, which has so much more power over the black bog mould than the grey lime-stone gravel. Another improvement was discovered, by observation of the greater luxuriance of the grass over which the clearings of the drains had been accidentally spread, and thus, as it were, landed the roots of the grass, which had been stripped by the constant washing of the rain. Mr. Fetherston now systematically top-dresses with bog-mould, leaving the gravel and roots of grass between two layers of bog.

"We shall now give the summary of expense, as taken from Mr. Fetherston's accounts, and then what we conceive to be the present value of the land—as it is upon a comparison of outlay and return alone, that any just idea of the result of any similar undertaking can be founded. The several items of stock employed may be stating as costing—

	£	s.	d.
Railway, per perch	2	15	0
Waggons, per	5	0	0
Roller	14	0	0
Plough	2	10	0
Tommy-spade	0	8	0
Spade	0	3	0
Shovel	0	2	6
Scoop	0	5	0
Horse pattens, per set	0	12	6
Men's pattens, per set	0	3	0

“ The cost of the whole undertaking may thus be stated :

Paid for Railway, Implements, &c. . .	500	0	0
Cost of reclaiming 50 acres, at £12 per .	600	0	0
Cost of reclaiming 100 acres, at £7 per .	700	0	0
	1800	0	0
Interest on actual outlay, at 5 per cent.	90	0	0

“ We have carefully examined the land, and valued it. We believe it to vary much in quality ; that which has been the latest improved is the best, and though reclaimed at so much less cost, is now more valuable—worth probably at least £1 per plantation acre ; but the average of the whole cannot be stated at less than 15s. per acre, as grass land, and this gives a return of £107 10s.

“ But it must be added, that this is the most strict, and least favourable way of calculating the result. The interest on the outlay is calculated upon the whole stock, which is little injured, and upon the greater cost of labour at the beginning, when the labourers were inexperienced, and the mode adopted more expensive than that which has recently been found equally, or more effective. By taking the minimum of expense, and maximum of value—which is, perhaps, the fairest way—as the example being before their eyes, it is in the power of any one to do so now in practice,—the return will prove about 14 per cent.

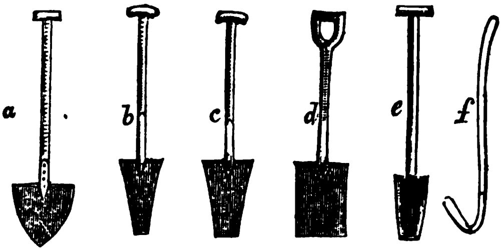
“ Mr. Fetherston thinks that the uses to which he puts the railway upon his upland farm—in carting out stuff, drawing lime, and turf, &c. &c. amply compensates him for the original cost of it ; and he confidently expects to be able, by means of manure and lime, to keep the improved bog in a state of perpetual meadow, by which, of course, its actual value would be greatly increased. The only question which now remains for us to give an opinion upon is, the durability of the improvement. It has been said, that bog will ever revert to its original condition of bog again ; but we do not see any reason to suppose that a change should occur in such a degree as to alter materially the value of the speculation. Even should it decline in productiveness after a series of years, the gravel and lime are at hand, and may be applied to, and worked into the solid and drained surface at a trifling expenditure.”

The following is the detail of draining, claying, &c. pursued by Mr. Bermingham, the active and zealous agent of Lord Clonbrock, on the flat red bog of Critt, in the county of Galway, which may be considered the most approved method, founded on the practice of Mr. Reid, at Chatmoss :

He divides the portion to be reclaimed into parallelograms, each containing three statute acres—66 yards wide, and 220 yards long ; these parallelograms are bounded by open drains, 4 feet wide at the top, 14 inches at the bottom, and four feet in depth. Parallel covered surface drains, at average distances of 16½ feet, (the intervals are regulated by the state of the bog as to moisture,) are then cut at right angles to the open side-drains, and terminating in these at each end, so that if obstructions should occur towards one end, the water may flow off at the other.

The width of these at top is, one foot six inches; and the depth to the shoulder, one foot ten inches; at the shoulder, is one foot two inches; and each shoulder is three inches wide, leaving the top of the hollow part of the drain, eight inches in breadth; the hollow is fourteen inches deep, and six inches broad.

In opening the surface drains the workmen stand opposite each other, outside the lines which are marked out with the spade, called a tommy, fig. *a*, which, including the handle, is four feet three inches long; the top sod is first taken out and laid on one side, the second is then cut out with the spade *d*, and laid on the other side; a man then goes into the drain with the spade *b*, and cuts out the deep and narrow section of peat below the shoulders, and another labourer follows with a scoop*, fig. *e*, for clearing out the bottom, where, as already stated, the breadth is only six inches.



After the top soil has lain a sufficient time to part with its moisture, it is placed on the shoulders, and after another interval of time, the second *spit* and a sufficient quantity of the remaining stuff are thrown over this, which completes the operation of covering, which is effected at the small cost of one penny farthing per English perch. The extreme cheapness of this operation obviously arises from having all the materials on the spot, without any cartage whatever.

The cost of the open drains is about five pence per perch. It is necessary that the covered drains should not be of less depth than that adopted by Mr. Bermingham, for although it may at first appear that a channel 14 inches deep is more than necessary to carry off the mere surface water, it must be recollected that from the subsidence and consolidation of the bog, which will be consequent on the abstraction of its moisture, a considerable allowance should be made for the diminution of the depth of the drains. The next operation, after completing the drains, is to level the entire surface perfectly, with spades *d*, filling up the hollows with inverted sods.

Mr. Bermingham then recommends digging at all times in the first instance, in preference to ploughing, taking care that the surface should be dug down eight inches deep, perpendicularly, (with the spade *c*, to prevent the workmen from merely skinning the bog, which, without being well watched at task, they are exceedingly inclined to do. The expense of digging is about £1 10s. per Irish acre. After this digging, before the gravelling takes place, while the bog is in a soft state, the sooner and oftener the cutter is applied the better, before the bog bakes into turf, as it will then have but little effect. The cutter, from the force of resistance, will require the power of four horses. This implement is composed of a number of circular knives, which being placed at short distances, parallel to each other, cut the sods into small pieces, so as to hasten the decomposition of the surface. To the prize essay of Mr. Reid, (who conducted the experiment at Chatmoss,) "on the best method of reclaiming red bog," we refer the reader for more minute particulars on this and other points.

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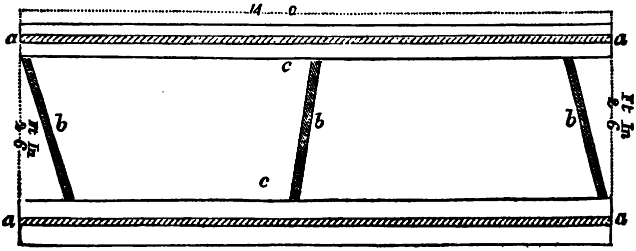
* *f* represents another kind of scoop used by drainers; of these there are several forms.

The following is a brief description of the *barrow* railway: it consists of long bars of iron, one inch broad, and 3–8ths of an inch in depth, firmly screwed down to parallel sleepers at the distance of two feet six inches in the clear. The parallel rails were at first nailed down on cross sleepers of timber; it has, however, been cheaper and more portable to join them with three iron stay-bars, nailed across in a slightly diagonal direction, as appears in this figure.



a, a, a, a, are the bars of iron laid upon the parallel sleepers *c, c,* and fastened together by the stay bars *b, b, b ;* the rails are united by means of iron sockets made to fit the rails at the points *a, a, a, a ;* these sockets are four inches long, so that two inches, or one half of the socket, is permanently fastened to the rail, whilst the remaining two inches are left open for the insertion of the rails, which are to be joined to that pair to which the sockets are fastened. The waggons which run on this railway are made double, so as to be emptied on both sides. Each part is five feet three inches in length, two feet eight inches in breadth, and ten inches in depth; the two outsides open and fall back like a shutter.

There is a light description of wooden plough, drawn by one horse, which works exceedingly well on this bog, to be got at the Haigh foundry, Wigan. The pattens can be obtained by applying to Mr. Patrick M'Keogh, the smith at Kilconnel. The horses should always be worked with pattens, in the early stage of the improvement, to prevent injury to the covered drains from their feet; a heavy roller is recommended, when the state of the land will bear it. The gravelling—there is lime-stone gravel on a part of this bog—is next done, and this is executed by means of railroads and waggons, and constitutes the principal expense—the total of which, including wear and tear, interest on capital, digging, draining, gravelling, manure, ploughing, sowing oats and grass seeds, has been £30 per acre—and varies according to the distance from which the gravel or clay is drawn. Various descriptions of waggons for claying have been used: those now most approved at Critt, are double waggons discharging at each side, and turning on knuckle hinges; they are fastened in the centre, at the top, by a staple; care should be taken that the descent for the waggons into the gravel-pit does not exceed 1 in 30.

Mr. Bermingham applies lime and clay, or lime and the peat which is raised in scouring the drains, as top-dressing subsequently. Limestone gravel is the very best substance that can be applied to any bog, and Lord Clonbrock is fortunate in having this at his command, especially as it serves a double purpose after being laid in the bog, for Mr. Bermingham has the large stones collected and burnt with the rough pieces of peat taken from the drains, in small circular kilns, containing about 100 barrels, at the trifling cost of five pence per barrel.

Before cropping he applies 100 barrels of lime, mixed with clay, (which we think an unnecessary labour, as each might perhaps be better applied separately,) to the acre, besides the previous gravelling.

Wheat has not been yet grown on the bog of Critt; and Mr. Bermingham, (and we are decidedly of his opinion,) is by no means certain that a corn crop is the best in the first instance, and thinks that rape, with grass seeds, or turnips and potatoes, and cabbages, to be followed by barley or oats will succeed better; and he particularly recommends the trial of Italian rye-grass, which he considers well suited to bog land. He is now feeding sheep (confined by hurdles) on some of the reclaimed bog, where he has turnips and artificial grasses. The principle pursued at Critt, is not to burn the surface, but to convert the upper sod into mould.

The managers of this bog improvement now oblige the persons who contract for the gravelling, (by measurement,) to keep the railroad, &c. in repair, for otherwise they take little care to prevent them from being injured, and the cost of repairs is heavy.

Experience has taught Mr. Bermingham the economy of making the roads for conveying the clay or gravel to the bog, narrow, and applying the road metal gradually, (*and not until the roads are dry,*) just enough to support the horses,—and of using broad-wheeled carts, for those with narrow wheels cut up the roads quickly, and convert them into a mass of puddle; without great care in this important particular, interminable expense and immense waste of labour will be incurred.

Mr. Bermingham states, that from his experience, he is decidedly of opinion, that it is more profitable to reclaim the worn-out bogs, which have, perhaps, but an average of two feet of peat incumbent on an argillaceous or gravelly bottom; this, of course, he effects by trenching deeply, besides draining and manuring. A practical proof of what may be done on such land, has been afforded by Robert Chaloner, Esq. at Coolattin Park, in the county of Wicklow, for Lord Fitzwilliam, at about the same expense as that incurred at Critt, but with a *corresponding return in crops*. Prudential consideration is to be recommended in all speculations on bog improvements on a large scale, and they should never be undertaken without abundant capital, and a perpetuity of interest in the moss to be reclaimed.

When the surface of bog, or more correctly speaking, of moor, is even, and productive of grasses, though coarse in quality, it is better, (after perfect draining,) to spread quick lime on the sward, without breaking it up, than to enter upon a course of tillage; in the course of two years the lime will convert the coarse herbage into sweet and excellent grasses for meadow or pasture. Those moors which have a covering of peat so shallow as to admit of its admixture with the sub-soil, may be easily rendered productive of potatoes or turnips; many mountain small-holders have profitably used the spade and shovel on such soils; the sooner, however, that land of this nature—we include bogs of all denominations—can be laid down, the better.

"An example of what bog-land, properly reclaimed, will do, in the way of *garden*, may be seen on the great flow-bog, near Limerick, consisting of 184 Irish acres, which Messrs. Steele and Brown have taken for the purpose of supplying fuel to their distillery at Limerick. A few years ago, this spirited company commenced their first operations by building, in this bog, a neat slate cottage, (for their very active and intelligent manager,) which is so deep that the roof of the house, (based on the firm sub-soil, many feet below the surface,) was hardly visible from the Shannon, which bounds this tract on the western side, until the turf around it was cut away.

"In the course of a few years, after dividing the bog by straight drains, intersecting each other at right angles into sections, containing about six acres each, and cutting away the peat in regular courses, a considerable extent has been converted into meadow land, and a garden formed adjoining the house. The portion devoted to garden, like the other reclaimed parts, has not been sunk to the solid sub-soil; it is elastic to the tread, yet sufficiently consolidated by a covering of bluish clay, two or three inches in depth, laid over the fibrous and refuse portions of the abstracted peat, and incorporated with it by the successive operations of the spade.

> "The hedge of thorn quicks which surrounds this garden, so interesting from the peculiarity of its location—in the midst of countless masses of turf clamps—is eight feet in height, and the kitchen vegetables flourish in a corresponding degree. We measured the stalks of Knight's marrowfat peas, which reached a most extraordinary elevation.
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> "Among the flowers we reckoned—Belladonna lilies; Potentillas; Siberian larkspur; Gladiola grandiflora; Rockets (15 inches long); Tiger Iris; Paradise plant; Gum coccineum; double-flowering Peach; Monkey-plant; Celestial rose; Heaths; Alpine Eringoes; sweet-scented Peonies; dwarf Rhododendron; and Pansies, of a very fine description. The house itself, which is kept in a state of neatness most creditable to the superintendent, who occupies it, is embellished with vines—not unproductive—and the Pyrus Japonicus."

Bog which yields the best turf for fuel, is of the most favourable kind for reclaiming; in estimating the probable expense of this, (other circumstances being equal,) it should be borne in mind that the cost of improving a very extensive bog will be greater in proportion than that of reclaiming one of more limited size—supposing the same scale of machinery for each—from the greater difficulty of conveying lime, marl, &c. to the centre, or more distant parts of the former, unless these fertilizing substances be within the bog itself. In the case of Chatmoss, many favourable circumstances tended to aid the speculation, viz. roads, canals, railroads, and (excepting London) contiguity to the most populous and wealthy towns and neighbourhoods in England. The bogs of Ireland have no such advantages. The suitable manures, with the best mode of applying them on bogs, will be seen under the head *Manures*.

BOTTS—See *Horses*.

BRAIRD—The first sprout or shoot of a plant; this is a Scotch term.

BREWING—The only feasible mode of counteracting the unhappily prevailing taste of our lower orders for ardent spirits, which engender more disease and pauperism and crime than all the direct inflictions of the Almighty put together, is by establishing the habit of domestic brewing; or to encourage public breweries to supply ale and beer of such quality as will gradually induce the consumer of spirits to disengage himself from the destroying demon of liquid fire, and attach himself in preference to the substantial compound of malt and hops—(how rarely combined at present in their due proportions, if at all!)—which, if used in moderation, is strengthening and refreshing. What is called beer, at the country breweries, is usually concocted from various villanous drugs, which the abused art of chemistry has rendered imposing substitutes for the true ingredients of that liquor. The legislature seem lamentably inattentive to the immense extent of moral mischief occasioned by the almost unrestricted use of ardent spirits, (these too are deleteriously drugged by unprincipled retailers,) else, at any temporary loss of revenue arising from a deficiency in the consumption of whiskey, gin, &c. they would charge almost a prohibitory tax upon these agents of the "foul fiend," which make the previously disposed sinner "two-fold more the child of hell" than he was before he submitted his reason to their influence, and encourage the manufacture of *genuine* malt liquors.

The expense of punishing and restraining those open crimes against the good of the state, and of relieving the misfortunes and indigence, which habitual indulgence in the use of intoxicating liquors occasions, is really more in amount than the income derived from the legalised permission to indulge in the free use of them.

While public spirit-houses are licensed for the merest trifle, and in almost unlimited numbers, by the voices of a too pliant magistracy, it is in vain to preach against intemperance, or to advocate effectually the case of Beer *versus* Whiskey and Co.; we must only hope for a better system of things, and in the mean time, proceed to give the best directions within our power for making *real* malt liquor—not that spurious mixture which brewers, (though sometimes without reason, inasmuch as neither malt nor hops are in its composition,) are *politely* disposed to term ale and beer.

Historians relate that the favourite beverage of the ancient Irish and Britons, from the most remote antiquity, was ale, (*curmi,*) made from barley and heather and other bitter herbs, until hops, which were introduced into England from the Netherlands in the reign of Henry the Eighth, became the substitute for these. Heather beer was a common drink in the British islands for a long time; and we believe that at this day heather and wormwood, when bitter drugs from the chemist or apothecary are not available, are more used in Ireland than hops. Nor was this kind of beer in the earlier ages confined to Great Britain and her western dependencies; the northern Europeans generally indulged in heather beer; the Danes were well acquainted with the mode of manufacturing it, and it is said, in corroboration of this, that a mill and some brewing vessels, with a Danish manuscript on the art of brewing heather beer, were dug up some years ago in the county of Limerick.

There are, however, it must be fairly admitted, some admirable breweries in Ireland, on a scale of enterprise and with details of manufacture highly creditable to the proprietors; but these are generally limited to great cities, or districts not remote from them;

the petty provincial brewers, with few exceptions, make very bad beer; and domestic brewing, though the excise laws have been at length rendered favourable to the practice, has not been renewed.

The facility of obtaining beer—though execrable in quality—from the public brewery, ignorance of the process of brewing, so long abandoned in Ireland, and a notion that it is very troublesome, prevent the farmer from making beer. He can have a gallon of whiskey without any trouble at all, and this too often becomes the companion of his solitary and leisure, as well of his festive hours. But to the practical details.

The ingredients of both ale and beer *ought* to be very simple—water, malt, and hops. The water should be soft and clear; *fresh* rain water is best, and next to this in quality is clear pure river water, which has run freely over a bed of sand or gravel.

Malt—This varies considerably in quality; pale malt, (which owes its colour to drying at the lowest temperature,) is preferred for Scotch ale, probably because it contains the greatest quantity of saccharine matter, but the colour is immaterial. The excellence of the quality is ascertained by the thinness of the skin, the ease with which the grain is bitten asunder, the abundance of sweet white flour; the buoyancy of the grain when immersed in water is another criterion; if it be hard and steely it sinks, but if it be properly malted it floats.

> "The world is wicked enough to think," says Cobbett, "and even to say, that there are maltsters who, when they send you a bushel of malt, *put a little barley amongst it*, the malt being *taxed*, and the barley *not*. The immersion of a little of the malt, therefore, in water, is useful as a means of detecting imposture. The grains which sink are the unmalted barley—those which float about the middle, the partially or imperfectly malted—and those which float on the surface, the well malted. The brewers consider that if not more than a twentieth part of it sink the malt is good. Malt, however, which stands this test is seldom to be met with."*

The different proportions of the saccharine substance in different parcels of malt, is only to be ascertained by an instrument called a saccharometer, which if applied even to a very small quantity of worts, will, to the person who understands its use, give the desired test; but the domestic brewer on a small scale, requires no other instruments for distinguishing the good and bad properties of his malt, than his eyes and teeth.

Hops—The best are said to be those produced in Kent, though that county,

> "in the produce of its hops, considered as uniting flavour with strength, is far from being uniform in its general priority in this respect; for different parts pro-

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* The Scottish Ale Brewer, by W. H. Roberts.

duce different qualities, varying with the soil, or some other local circumstance, and all yielding the palm of superiority to those which grow in the neighbourhood of Canterbury. . . . The flavour of Worcester hops has a grateful mildness not to be met with in any other hops. Hence the finest growths of Kent, in Lancashire, Cheshire, and some other counties where the use of Worcester hops prevails, would be rejected as unsaleable; and so great is the objection of some of the inhabitants of those counties to the flavour of Kent hops, that I have heard them distinguish ale bittered with the latter by the name of *porter ale.* Indeed, the distinction has propriety in it, so far as the strength of a large portion of these may convey to some palates the idea of *porter*, and that the mildness of the former can hardly be applicable to any liquor but *ale.*"*

"The method by which the value of hops is ascertained, is by rubbing a few of the pods in the palms of the hands, and observing whether by this friction a small yellow dust is produced, while a clammy resinous substance, exhaling a most fragrant odour, is perceptible; and at the same time whether the hops are of a fine, bright, yellowish olive-green colour."†

All hops lose their properties by age; after twelve months they decrease from 20 to 30 per cent. in value, lose their aroma, and are unfit for the finer ales, though their power of *preserving* beer, without imparting a pleasant flavour, will continue, if they are taken proper care of, for many years, as they do not lose the bitter principle, though they soon part with the aromatic flavour.

Grinding or Crushing.—Mr. Roberts is in favour, for ale brewing, of crushing the malt between rollers; but the operation will be defective if the malt be bad, as in this case the rollers do not crush it completely. But the more general mode, we believe, is to grind by mill-stones, or in a steel-mill constructed like a coffee-mill, which fully answers the purpose. The object is to have the malt so perfectly ground "as to allow the liquor free access to every particle of the bruised kernel, in order to extract the good it contains."

Our own first experiment in domestic brewing was conducted, and concluded, rather whimsically:

Mrs. Doyle, the compiler's wife, procured a bushel of prime malt during the absence of her husband at a distant fair, and being anxious to convince him of the *great saving* which would accrue from making our own ale and beer, set to work with most praiseworthy zeal, to convert the said malt, with a due proportion of hops and hot water, into a superior kind of malt liquor: nor did she act alone on this important occasion; one of her sons, a candidate barrister, with Cobbett's Cottage Economy in his hands, gave his opinion in the different parts of the process, with an exceedingly correct construction of the different clauses in Cobbett's digest, and an air of importance which it is to be hoped he will carry to the bench in due time. There were half-a-dozen dairy-maids and plough-boys besides, who volunteered to sit up with the mistress and her son for the greater part of a long night, in order that no failure should take place from want of watchfulness and labour, while the mashing and boiling continued. At the proper time, a pellucid liquid was gently drawn from the boiler to the cooler, and the counsellor (so he was familiarly called by the family) dipped his fingers from time to time into the liquor, which he pronounced, as he licked them, to be excellent, though rather weak and more pale than is usual even for the palest butt. But he remarked that the strongest whiskey was pale on issuing from the still, and assured his anxious mother that the beer would acquire colour with age and bottling.

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* Richardson's Treatise on Brewing.

† The Scottish ale brewer.

It was found on the morrow that the pellucid contents of the cooler had neither taste nor colour, and on examination it appeared that Mrs. Doyle had never thought of inquiring if the malt had been *ground.*

As may be supposed, there was no extract whatever from it, the water was as free from intoxicating qualities, and as thin a potation as even Winifred Jenkins herself would have recommended for her dairy maids. Mrs. Doyle and young hopeful put their heads together and agreed that there was no use in telling the master any thing of the matter, and that the malt would be an excellent breakfast for the pigs. This is merely a hint as to the necessity for reducing the malt in the first instance, by either grinding or crushing to a state of powder.

"If the malt be ground to a very fine powder, it will *set* with water to a less elevated temperature than if it be more coarsely ground; it will part with the water, so as to form a transparent solution with more difficulty, and the whole of the valuable portion of the malt will not be extracted. When the malt is merely bruised, or broken into moderately small parts, the water penetrates the substance of each, acts upon its interior, and afterwards is drained out of it, being in a manner strained by percolation through its interstices. It is certain, however, that but for the reasons just assigned, the more minutely the malt is divided in grinding, the more readily would its saccharine part be dissolved away; and it will still be a good method to grind tolerably fine, provided that due agitation be used. But if considerable agitation be not used, the fineness of the powder, by forming a paste permeable with difficulty by water, will rather obstruct than assist the solution; and a weak extract will be obtained. Length of time in mashing will compensate coarse grinding. If the malt be coarsely ground, allowing the hot water to act on it for a greater length of time will at length dissolve every thing soluble from the grain. But delays are particularly dangerous in brewing; and often to them may be attributed the commencement of sourness, which has ultimately destroyed the produce. In all cases, the husk of the malt must be completely detached from the grain; for so refractory does it prove to the permeating influence of water, that an unbruised grain of malt will remain long submerged without giving out its saccharine principle. But although the husk should be detached, it should by no means be broken down into powder; on the contrary, its hardness, size, and substance, have the effect of keeping the farina open and porous; the water is thus the better allowed to permeate, and there is less risk of setting.

"The principles which ought to direct us in the grinding of malt seem, therefore, to be as follow:—We should, if possible, totally detach the husk. We should break down the cohesion of the interior of the grain in such a manner as that no part of its natural hardness should remain unsubdued. But the perfection of the process would be, if having succeeded in subduing the cohesion of the grain, its parts were still to remain cohering with just as much force as would prevent their falling into flour, yet would permit the complete entrance of the water amongst all the disintegrated particles. The nature of this would be best expressed by the word *crushing*. Were it possible to effect all this, the advantages would be, that it then becomes not only allowable, but highly beneficial, to use water of a higher temperature in mashing than should otherwise be used, such as will with more effect produce the solution or evolution of the saccharine matter, (whichever the truth may be,) or, in technical language, produce a rich extract. This would be accomplished without danger of setting, or enveloping, instead of cooling, the sweet principle; and after the mashing, there would be found no difficulty in drawing fine transparent worts, without holding entangled any insoluble parts of the malt."*

The utensils necessary, are a copper boiler, which costs about £5; a mashing tub, which should hold twice as much as the copper; a tun tub; a shallow tub for the wort to run into,—called in England an *underbuck*; and three coolers; and these last may be easily made from materials of a grocer's sugar cask, cut into three parts, and bottomed: the expense of these coolers and the tubs ought not to exceed £2. Where great economy is required, a common washing tub, well scrubbed, will answer for the underbuck; a round basket, such as is used by laundresses for clothes, will answer for a sieve to strain the beer from the hops; the handle of a sweeping-brush or broom will answer for a mashing stirrer; a wooden bowl with a handle, a tun-dish or funnel, and two or three casks with cocks, bungs, and vent pegs, complete the list of apparatus.

A correspondent of Mr. Cobbett informed him "that the whole of the utensils used by him, are a twenty-gallon *pot*, a mashing tub, that also answers for a tun tub, and a shallow tub for a cooler, and that these are plenty for a person who is any thing of a contriver. A nine gallon cask of beer can be brewed very well with such utensils."

There are no details of the brewing process for domestic purposes preferable, if equal, to those which have been given by Cobbett. These, with a few omissions, are here given verbatim.

"I shall suppose that, for the tradesman's family, it will be requisite to brew eighteen gallons of ale and thirty-six of small beer, to fill three casks of eighteen gallons each. It will be observed, of course, that, for larger quantities, larger utensils of all sorts will be wanted. I take this quantity as the one to give directions on. The utensils wanted here will be, First, a *copper* that will contain *forty*

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* Professor Donovan's Treatise on Brewing.

gallons at least; for, though there are to be but thirty-six gallons of small beer, there must be space for the hops, and for the liquor that goes off in steam. Second, a *mashing-tub* to contain sixty gallons; for the malt is to be in this along with the water. Third, an *underbuck*, or shallow tub, to go under the mash-tub, for the wort to run into when drawn from the grains. Fourth, a *tun-tub*, that will contain thirty gallons, to put the ale into, to work—the mash-tub, as we shall see, serving as a tun-tub for the small beer. Besides these, a couple of *coolers*, shallow tubs, which may be the heads of wine buts, or some such things, about a foot deep; or if you have *four* it may be as well, in order to effect the cooling more quickly.

"You begin by filling the copper with water, and next by making the water *boil*. You then put into the mashing-tub, water sufficient *to stir and separate the malt in*. But now let me say more particularly what this mashing-tub is. It is, you know, to contain *sixty gallons*. It is to be a little broader at top than at bottom, and not quite so deep as it is wide across the bottom. In the middle of the bottom there is a hole about two inches over, to draw the wort off through. Into this hole goes a stick, a foot or two longer than the tub is high. This stick is to be about two inches through, and *tapered* for about eight inches upwards at the end that goes into the hole, which at last it fills up closely as a cork. Upon the hole, before any thing else be put into the tub, you lay a little bundle of *fine birch* (heath or straw *may* do), about half the bulk of a birch broom, and well tied at both ends. This being laid over the hole [to keep back the grains as the wort goes out], you put the tapered end of the stick down through into the hole, and thus *cork* the whole up. You must then have something of weight sufficient to keep the birch steady at the bottom of the tub, with a hole through it to slip down the stick; otherwise, when the stick is raised, it will be apt to raise the birch with it and when you are stirring the mash you would move it from its place. The best thing for this purpose will be a *leaden collar* for the stick, with the hole in the collar plenty large enough, and it should weigh three or four pounds. The thing they use in some farm-houses is the iron box of a wheel. Any thing will do that will slide down the stick, and lie with weight enough on the birch to keep it from moving. Now, then, you are ready to begin brewing. I allow *two bushels* of malt for the brewing I have supposed. You must now put into the mashing-tub as much boiling water as will be sufficient to *stir the malt in* and *separate it well*. Bnt here occur some of the nicest points of all; namely, the *degree of heat* that the water is to be at, before you put in the malt. This heat is *one hundred and seventy degrees* by the thermometer. If you have a thermometer, this is ascertained easily; but, without one, take this rule, by which so much good beer has been made in England for hundreds of years: when you can, by looking down into the tub, *see your face clearly in the water*, the water is become cool enough; and you must not put the malt in before. Now put in the malt and *stir it well in the water*. To perform this stirring, which is very necessary, you have a stick, somewhat bigger than a broom-stick, with two or three smaller sticks, eight or ten inches long, put through the lower end of it at about three or four inches asunder, and sticking out on each side of the long sticks. These small cross sticks serve to search the malt and separate it well in the stirring or *mashing*. Thus, then, the *malt is in;* and in this state it should continue for about a quarter of an hour. In the mean while you will have filled up your copper, and made it *boil;* and now [at the end of the quarter of an hour] you put in boiling water sufficient to give you your eighteen gallons of *ale*. But, perhaps, you must have thirty gallons of water in the whole, for the grains will retain at least ten gallons of water; and it is better to have rather too much wort than too little. When your proper quantity of water is in, stir the malt again well. Cover the mashing-tub over with *sacks*, or something that will answer the same purpose; and there let the mash stand for *two hours*. When it has stood the two hours, you draw off the wort. And now, mind, the mashing-tub is placed on a *couple of stools*, or on something that will enable you to put the *underbuck* under it, so as to receive the wort as it comes out of the hole before-mentioned. When you have put the underbuck in its place, you let out the wort by pulling up the stick that corks the whole. But, observe, this stick, which goes six or eight inches through the hole, must be raised by degrees, and the wort must be let out *slowly*, in order to keep back the *sediment;* so that it is necessary to have something to *keep the stick up* at the point where you are to raise it, and wish to fix it at for the time. To do this, the simplest, cheapest, and best thing in the world is a *cleft stick*. Take a *rod* of ash, hazle, birch, or almost any wood—let it be a foot or two longer than your mashing-tub is wide over the top; *split* it, as if for making hoops; tie it round with a string at each end; lay it across your mashing tub; pull it open in the middle and let the upper part of the wort-stick through it; and when you raise that stick, by degrees as before directed, the cleft stick will hold it up at whatever height you please.

"When you have drawn off the *ale-wort*, you proceed to put into the mashing-tub water for the small beer. But, I shall go on with my directions about the ale till I have got it into the cask and cellar; and then shall return to the small-beer.

"As you draw off the ale-wort into the underbuck, you must lade it out of that into the tun-tub, for which work, as well as for various other purposes in the brewing, you must have a bowl-dish with a handle to it. The underbuck will not hold the whole of the wort. It is, as before described, a shallow tub, to go under the mashing-tub to draw off the wort into. Out of this underbuck you must lade the ale-wort into the tun-tub; and there it must remain till your copper be emptied and ready to receive it.

"The copper being empty, you put the wort into it, and put in after the wort, or before it, a pound and a half of good hops, well rubbed and separated as you put them in. You now make the copper boil, and keep it, with the lid off, at a good brisk boil, for a full hour, and if it be an hour and a half it is none the worse.*

"When the boiling is done, put out your fire, and put the liquor into the coolers. But it must be put into the coolers without the hops. Therefore, in order to get the hops out of the liquor, you must have a strainer. The best for your purpose is a small clothes-basket, or any other wicker-basket. You set your coolers in the most convenient place. It may be in-doors or out of doors, as most convenient. You lay a couple of sticks across one of the coolers, and put the basket upon them. Put your liquor, hops and all, into the basket, which will keep back the hops. When you have got liquor enough in one cooler, you go to another with your sticks and basket, till you have got all your liquor out. If you find your liquor deeper in one cooler than the other, you can make an alteration in that respect, till you have the liquor so distributed as to cool equally fast in both, or all, the coolers.

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* The Scotch *ale*-brewers in general boil the worts a shorter time than is the custom in England—from one hour to an hour and a half. The aroma of the hops is lost, and a coarse flavour is obtained, if the time of boiling exceed an hour, or perhaps a little more. A shorter period will not be sufficient for extracting the high flavour, and the preserving principle of the hop, and to break the wort."

" The next stage of the liquor is in the tun-tub, where it is set to work. Now, a very great point is, the degree of heat that the liquor is to be at when it is set to working. The proper heat is seventy degrees; so that a thermometer makes this matter sure. In the country they determine the degree of heat by merely putting a finger into the liquor. Seventy degrees is but just warm, a gentle luke-warmth. Nothing like heat. A little experience makes perfectness in such a matter. When at the proper heat, or nearly, (for the liquor will cool a little in being removed), put it into the tun-tub. And now, before I speak of the act of setting the beer to work, I must describe this tun-tub, which I first mentioned. It is to hold thirty gallons, as you have seen; and nothing is better than an old cask of that size, or somewhat larger, with the head taken out, or cut off. But, indeed, any tub of sufficient dimensions, and of about the same depth proportioned to the width as a cask or barrel has, will do for the purpose. Having put the liquor into the tun-tub, you put in the yeast. About half a pint of good yeast is sufficient. This should first be put into a thing of some sort that will hold about a gallon of your liquor; the thing should then be nearly filled with liquor, and with a stick or spoon you should mix the yeast well with the liquor in this bowl, or other thing, and stir in along with the yeast a handful of wheat or rye flour. This mixture is then to be poured out clean into the tun-tub, and the whole mass of the liquor is then to be agitated well by lading up and pouring down again with your bowl-dish, till the yeast be well mixed with the liquor. Some people do the thing in another manner. They mix up the yeast and flour with some liquor (as just mentioned) taken out of the coolers; and then they set the little vessel that contains this mixture down on the bottom of the tun-tub; and, leaving it there, put the liquor out of the coolers into the tun-tub. Being placed at the bottom, and having the liquor poured on it, the mixture is, perhaps, more perfectly effected in this way than in any way. The flour may not be necessary; but, as the country people use it, it is, doubtless, of some use; for their hereditary experience has not been for nothing. When your liquor is thus properly put into the tun-tub and set a working, cover over the top of the tub by laying across it a sack or two, or something that will answer the purpose.*

" We now come to the last stage, the cask or barrel. But I must first speak of the place for the tun-tub to stand in. The place should be such as to avoid too much warmth or cold. The air should, if possible, be at about 55 degrees. Any wool place in summer and any warmish place in winter. If the weather be very cold, some cloths or sacks should be put round the tun-tub while the beer is working. In about six or eight hours a frothy head will rise upon the liquor; and it will keep rising, more or less slowly, for about forty-eight hours. But, the length of time required for the working depends on various circumstances; so that no precise time can be fixed. The best way is, to take off the froth (which is indeed yeast) at the end of about twenty-four hours, with a common skimmer, and put it into a pan or vessel of some sort; then, in twelve hours' time, take it off again in the same way, and so on till the liquor has done working, and sends up no more yeast. Then it is beer—and when it is quite cold (for ale or strong beer) put it into the cask by means of a funnel. It must be cold before you do this, or it will be what the country people call foxed—that is to say, have a rank and disagreeable taste. We now come to the act of putting in the beer. The cask should be placed on a stand with legs about a foot long. The cask, being round, must have a little wedge, or block, on each side to keep it steady. Bricks do very well. Bring your beer down into the cellar in buckets, and pour it in through the funnel, till the cask be full. The cask should lean a little on one side when you fill it, because the beer will work again here, and send more yeast out of the bung-hole—and, if the cask were not a little on one side, the yeast would flow over both sides of the cask, and would not descend in one stream into a pan put underneath to receive it. When you put the beer in the cask, you should have a gallon or two left, to keep filling up with, as the working produces emptiness. At last, when the working is completely over, right the cask—that is to say, block it up to its level. Put in a handful of fresh hops. Fill the cask quite full. Put in the bung, with a bit of coarse linen stuff round it—hammer it down tight—and, if you like, fill a coarse bag with sand, and lay it, well pressed down, over the bung.

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* The degree of heat in the fermentation is of great importance. The variation of a few degrees produces a considerable difference in the effect. The proper management depends on such a multiplicity of apparently unimportant particulars, that some practice is required to ensure *perfect* success. The quality of the fermenting matter is also very important. The yeast, if sour, should not be used: it must be fresh and sweet. In some ale breweries, there is great care taken to have the store yeast from a stock which has been of an equal gravity to the wort for which it is now required, and the product of sound worts. " It is a well-known fact that yeast used as a ferment, and invariably continued for a length of time, the produce of one gyle supplying the ferment of the next, does so far degenerate that (like the degeneracy of corn sown upon the same field which produces it for a succession of crops) it will not effect a perfect fermentation; and yet the same yeast, employed by another brewer, shall do its duty."—*Richardson.*

"As to the length of time that you are to keep the beer before you begin to use it, that must, in some measure, depend on taste. Such beer as this ale, will keep almost any length of time. As to the mode of tapping, that is as easy almost as drinking.

"I have now done with the ale, and it remains for me to speak of the small beer. I left you drawing off the ale-wort (page 71) and with your copper full of boiling water. Thirty-six gallons of that boiling water are to go into the mashing-tub; the grains are to be well stirred up, as before; the mashing-tub is to be covered over again, as mentioned in page 71; and the mash is to stand in that state for an hour, and not two hours, as for the ale-wort.

"When the small beer mash has stood its hour, draw it off as in page 71, and put it into the tun-tub as you did the ale-wort.

"By this time your copper will be empty again, by putting your ale-liquor to cool, as mentioned also in page 71. And you now put the small beer wort into the copper, with the hops that you used before, and with half a pound of fresh hops added to them; and this liquor you boil briskly for an hour.

"By this time you will have taken the grains and the sediment clean out of the mashing-tub, and taken out the bunch of birch twigs, and made all clean. Now put in the birch twigs again, and put down your stick as before. Lay your two or three sticks across the mashing-tub, put your basket on them, and take your liquor from the copper (putting the fire out first) and pour it into the mashing-tub through the basket. Take the basket away, throw the hops to the dung-hill, and leave the small beer liquid to cool in the mashing-tub.

"Here it is to remain to be set to working as mentioned for the ale in page 72—only, in this case, you will want more yeast in proportion, and should have for your 36 gallons of small beer, three half pints of good yeast.

"Proceed, as to all the rest of the business, as with the ale, only, in the case of the small beer, it should be put into the cask, not quite cold, but a little warm, or else it will not work at all in the barrel, which it ought to do. It will not work so strongly or so long as the ale, and may be put in the barrel much sooner—in general the next day after it is brewed.

"The reader will easily see, that in proportion to the quantity wanted to be brewed must be the size of the utensils; but, I may observe here, that the above utensils are sufficient for three, or even four, bushels of malt, if stronger beer be wanted.

"When it is necessary, in case of falling short in the quantity wanted to fill up the ale cask, some may be taken from the small beer. But, upon the whole brewing, there ought to be no falling short, because, if the casks be not filled up, the beer will not be good, and certainly will not keep. Great care should be taken as to the cleansing of the casks. They should be made perfectly sweet, or it is impossible to have good beer.

"A brewing, such as I have given the detail of above, may be completed in a day; but, by the word day, I mean to include the morning, beginning at four o'clock.

"The putting of the beer into barrel is not more than an hour's work for a servant woman, or a tradesman's or farmer's wife. There is no heavy work—no work too heavy for a woman in any part of the business, otherwise I would not recommend it to be performed by the women, who, though so amiable in themselves, are never quite so amiable as when they are useful; and as to beauty, though men may fall in love with girls at play, there is nothing to make them stand to their love like seeing them at work. In conclusion of these remarks on beer brewing, I once more express my most anxious desire to see abolished for ever the accursed tax on malt, which, I verily believe, has done more harm to the people of England than was ever done to any people by plague, pestilence, famine, and civil war."

BUCK WHEAT.—This is supposed to be a native of China, but is cultivated in the north as well as in the south of Europe, and also in North America, where the flour is usually worked up into batter and baked into cakes. It is mixed with other flour in various parts of the continent by bakers and confectioners, and used by the latter occasionally in London for very delicate confectionary, but not there in the manufacture of common bread. The distillers of English gin use it in large quantities.

Buck wheat grows best in light gravelly soils: the season for sowing it is from the middle of May to the middle of June. It requires to be guarded from birds, which are exceedingly fond of it. Mr. Main, of Chelsea, observes—

"It is a good deal cultivated in some of the poorest gravelly districts in the south of England, but only on fallows intended for wheat. In such light sandy or gravelly countries the fallow-fields are thoroughly worked and cleaned by the first of June; they are then drawn out into ridges, ploughed and immediately sown. If convenient, the dung intended for the fallow is carted on, and spread and ploughed in, before the brank* is sown; or this work may be deferred till the crop is carried in the autumn, just as it may suit the business of the farm.

"A bushel of seed is enough (not broad-cast) for an (English) acre; and if laid on regularly, when the ground is loose and warm, the plants soon make their appearance, and grow with great rapidity; so that the ground is soon covered and shaded by a dense mass of foliage. It begins flowering in July, and is generally fit to move about the beginning of October, (it does not ripen regularly, and should be cut while part is even in flower.) It is usually cut with scythe and cradle, and this implement in the hands of an expert workman is astonishingly expeditious; a good hand will cut down four or five acres with apparent ease. The scythe is put out for the purpose, and nothing is cut easier than the green succulent stems: the scythe requires to be swung by a tall and strong man. The crop is delivered from the scythe in swaths, as regularly as if laid by the hands; and if the weather be fine, it quickly withers and becomes fit to be carried to the rick-yard or barn. If put together, a little green or damp does not much signify, for though ever so mouldy, the grain is never damaged, and the more mouldy it is, the easier it is threshed. It is the easiest of all barn-work for the thresher, as the slightest blow separates the grain from the straw; and as the latter shrinks into very small bulk, is never bound, and only fit for litter, it is soon out of the hand of the thresher.

"Three or four quarters per acre is a fair crop. Its price generally ranges with that of barley, though when much wanted by the distillers, double the price of barley is freely given. It has been proved a thousand times over, that the crop of wheat after brank is always better than if the fallow had been kept naked all the summer, and whether the ground be dunged before or after the brank. This crop not only shades the ground and smothers every weed, but leaves the soil in a fine mellow state."

Mr. Main adds, that it is unfit for horses, as it occasions worms in them. He says also, that it renders pigs mad if they have unrestricted range over buckwheat stubbles, but supposes that its deleterious effects are removed by the process of baking, as it is constantly used in Russia and other countries as bread corn, without bad effects. The North Americans use it very much in the form of hot cakes, and eat very freely of it without bad effects, nor do *they* restrain their pigs from picking up the grains which fall in the fields after the harvest. It is good and cheap food for all sorts of poultry, and our farmers might judiciously sow small patches of it on their inferior soils; any extended sowing of it would be unwise, as the probability is, that it would not have been so generally abandoned in England if it had been suited to our climates, and productive. Although it grows in much colder climates than ours, our summer season is too unsteady for it, and buckwheat is tender, and until the grain is actually set, a very slight frost in September or October would destroy it.

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* Brank is another name for buckwheat. It is also the name of an instrument known in Scotland, and in Staffordshire, for correcting scolding women. *See Encyclopædia Britannica.*

BURNET.—The culture of this leguminous and perennial plant has been nearly abandoned, as it is very inferior to lucerne or clover; it only answers in dry and chalky ground, but under the most favourable circumstances it never attains a height exceeding ten or twelve inches; cattle in general do not like it; it is verdant however during the winter, and yields an early bite to sheep. The blossom is of a blood colour and very pretty. The best mode of sowing it, is in drills.

BURNING LAND.—The practice of burning the surface of bog land, *if not repeated,* is not only allowable but often necessary, where other manure than the ashes afforded on the spot cannot conveniently be obtained. In the Scotch and Irish bogs an excessive quantity of dead and insoluble vegetable matter exists, with a great deal of unprofitable living herbage, which cannot be so speedily or so effectually rendered available to the purposes of vegetation as by being reduced to ashes, for these contain alkalies which become food for useful plants. The burning destroys the noxious qualities which pre-existed, while it brings fertilizing substances into operation.

Where there is no excess of vegetable matter, or where the surface sods can be reduced to mould by the ordinary process of tilling and manures, it is unquestionably bad management to burn them, and therefore for clay soils, which are deficient in vegetable matter, burning, as a mode of manuring, appears improper. Some of the English farmers, however, on the downs of Oxfordshire, for instance, repeatedly pare and burn the surface, but they allege in excuse for a practice so apparently prejudicial, that their crops would be utterly destroyed by grubs and insects if the land were not periodically submitted to the action of fire.

On moors where there is but a thin coat of peat, it is far better to reduce the surface to mould by admixture with the under soil, and by decomposition, than to deprive it, by burning, of its vegetable substances. Poor sandy land is greatly injured by torrefaction. Sir Humphry Davy observes—

> "All soils that contain too much vegetable fibre, and which consequently lose from one-third to one-half of their weight, by incineration; and all such as contain their earthy constituents in an impalpable state of division, *i. e.* the stiff clays and marles, are improved by burning, but in coarse sands, or rich soils containing a just mixture of the earths, and in all cases in which the texture is already sufficiently loose, or the organizable matter sufficiently soluble, the process of torrefaction cannot be useful."

Clay soils are naturally too deficient in vegetable substances, and cannot afford to part with the little they may contain. Burning no doubt acts beneficially by separating their particles, but the merest rabbit sand, or any loosening matter, will, by its *mechanical* effects, correct adhesiveness; and therefore it is problematical whether burning clay is useful. The application of lime, and of farm-yard manure, with deep ploughing before the winter's frost, would effect this object sufficiently, without extracting from the soil whatever it has of value. Marl, or clay, when burned, is in truth little, if at all, better than brick-dust, or powdered pottery. See *Clay Kilns*, *Manures*, and *Paring* and *Burning*.

CABBAGES—The kinds best suited to the farmer's purposes are, the drum-head, flat-Dutch, cow-cabbage, borecole, and any of those species which produce heavily. Mr. Cobbett's plan of planting early York and sugarloaf will only answer for the cottager, who should keep up a continued succession from the earliest period of the spring to the winter, for his own table and the support of his cow and pigs. The maturity of the sugarloaf kind especially, is accelerated by tying the leaves together near the top; they will soon form a solid head in consequence. The best winter cabbage for the same purposes is the *M'Ewen*—a new species—which with the Edinburgh gardeners, weighs from eight to ten pounds in the middle of March. Where turnips or potatoes can be successfully cultivated, we are far from recommending cabbages of any kind; but in the worst yellow clay soils, where other crops will not succeed, cabbages will flourish in an extraordinary manner, and there of course they should be grown. With respect to the Cesarian cole or cow-cabbage, which is a perennial evergreen, the most extravagant statements have been made; if these be even *near* the truth, this cabbage must be the most wonderful and valuable addition to our vegetables. It is said to have been introduced into England by Mr. Fullard, probably from Jersey, and plants grown from seed—sold at a shilling a grain!—sown in August 1835, and transplanted in March following at two feet apart, were exhibited in 1836, at the Bedford conservatory, Covent Garden, in a growing state, at the height of six feet, but it is said to reach twelve feet in height, and from fifteen to twenty feet in circumference, and to have a stem strong enough to be used as a *rafter* for farm-buildings under thatch. Mr. Fullard's cow-herd has certified—God bless the mark! —that "five cabbages per day, is sufficient for one hundred sheep, or ten beasts, with proper management."

It is thought that it is the same as the *chou mille tetes* (hundred-headed cabbage) in Flanders, and the perennial Jersey kale, which grows from slips; Dr. Derinzy, of Carnew, who has cultivated it largely, has no doubt of the identity of the latter with the cow-cabbage. In Jersey they sow the seed in August, and transplant through the winter, which would not answer in our climate.

Mr. Barnes, of Cullenswood nursery, near Dublin, addressed a letter, in November, 1836, to the editors of the Irish Farmer's Magazine, respecting the Pampeluna cabbage, which he received on the 22nd of July direct from the place which gives it name; it appears that in the month of November

> "The plants which had been carelessly stuck in between young trees, without so much as the ground being dug, measured from seventeen to twenty feet in circumference, and from four to five feet in height; they are of the open growing kind, leaves nearly round, savoy like, deeply undulated, grows stiff and erect—colour a light, or rather a sickly green, with a head or extensive ramification from every vesicle, and forming from the surface an ornamental well-formed cone. They are tender and delicious for table use, and should they prove sufficiently hardy for our winters, will, in an agricultural point of view, be found the greatest acquisition of their tribe."

All cabbage seed should be sown in seedling beds, and pricked out once or twice from bed to bed, to increase and invigorate the roots; for the luxuriance of the plants in all stages, depends on the ability of their roots—the mouths as it were—to extract nourishment from the soil. The season for sowing the seed of drum-heads and flat-Dutch, and all those kinds which are planted in March and April for a general summer crop, is about August. It is judicious to have plants of the cabbage tribe—rape, perhaps, the best—to supply deficiencies in the turnip drills, during the month of July; in this case the ground should be well loosened before setting the plants, and the seed should have been sown in March. The great art in the culture of cabbages is, to dig the land perfectly between them, in order to allow the fibres to strike out freely; the moulding with plough or shovel is of no farther use than giving support to the stems from the force of the wind.

All field cabbages should have plenty of room; the rows should be thirty inches asunder, and the plants at least two feet apart in the rows; if the ground be rank, they had better be placed at thirty inches every way. Cabbages, though very inferior to vetches, lucerne, and clover, are good for milch cows, if freed from decayed leaves, and should always be immersed in boiling water, in order to discharge the elastic air, which produces flatulence, and of course deranges more or less the process of digestion. Treated in this way any part of the cabbage is eaten with avidity, even when they are on good grass, by cows who would otherwise reject it. If a small quantity of nitre be put into the pail before milking, no disagreeable taste will be communicated to the milk, and the same corrective substance put into the churn will preserve the butter from bad flavour. Cabbages, when steamed or boiled, and mixed with bran and a little salt, are excellent for store-pigs; and also assist in feeding calves at the end of the rearing season. They can be kept during a great part of the winter, if hung up in a dry place by the heels, and they afford excellent nutriment to milch cows, if prepared as for pigs; even the *stalks* may be chopped up, boiled for them, and mixed with bran or grains, &c. Forty tons of drum-heads have been often produced on a statute acre.

CALVES—The practice of Mr. Cramp of Lewes, in Suffolk, to whom the Board of Agriculture voted a medal for his mode of rearing calves, shall be given in his own words—

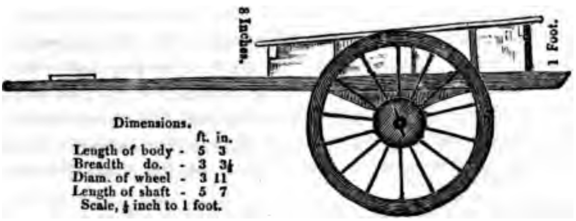
"I allowed the calf to suck the cow the first two days only, and afterwards milked the cow and gave it to the calf. There was some little trouble in getting it to drink the milk for a day or two, but it soon became quite natural; at the end of three weeks I left off giving new-milk, and fed it with skim-milk, adding about three pints of oatmeal gruel to the milk, at each time of feeding (twice a day,) putting the gruel hot into the milk, which made it sufficiently warm, for great care should be taken not to give it too warm; for no harm can arise by its being cold, but much damage in being hot: not more than milk-warm in the beginning, and decreasing gradually in giving it warm, till you give it quite cold. I so continued feeding, till it was about ten weeks old, and then gradually left off the oatmeal gruel, by lessening the quantity every time; I also weaned her off milk in like manner, by adding water to milk, till I reduced it to mere water, and as the gruel and milk were taken off, it took to eat hay, bran, grains, &c. At fourteen weeks old I had my calf completely weaned, and kept her four weeks afterwards on hay, bran, grass, &c. During the whole of the time she was in high condition, and not an instance of being in an ailing state during the eighteen weeks; at the end of which time I sent her to a friend's in the country, where she now is. By this mode of feeding I trained up a fine calf, without any reduction of butter, except a trifle in the beginning. I am certain this mode of bringing up calves must be a very advantageous one, not only the saving in butter, &c. but I think the cow is saved; for by allowing the calf to run with the cow till it is weaned, the cow is totally spoiled (for milk) that season; for she cannot be regularly milked, and what the calf does not suck, must dry away, and cause a contraction in the udder, which may ever after be an injury, especially if it be the first calf; in that case, every care ought to be taken to draw the milk, in order to expand the udder, for want of which many a valuable cow is spoiled for the dairy, and can never after be made what she would have been, if proper attention had been given at first. My cow calved the 2nd of April, has a very fine calf, and is in as profitable a state as at any former time; I am bringing up the calf on the same principle as I did the one last year, and find no difficulty in it whatever."

CARROTS—There are large species of field carrot, orange and long red, which are very valuable for cattle; but they should not be cultivated except in deep rich loam, inclining to sand, and equally good throughout, well prepared by repeated ploughings and harrowings; the first ploughing should be given in October, to the depth of twelve inches, one plough following another, if there be no trench plough: the second (a cross ploughing) early in February or March, and the third before sowing in April. Short dung should be ploughed into the ground at the second ploughing, as it is well known that carrots fork if sown on dung like potatoes or turnips. On account of the difficulty of separating the seeds, so as to deposit them evenly in drills, the usual way in England is to sow broad-cast, and afterwards to hoe out the supernumerary plants, leaving the remaining ones at a proper distance according to their luxuriance. Drilling is, however, sometimes practised, and we are of opinion that in Ireland especially, where hoeing is so awkwardly and badly attempted, sowing in rows at the distance of fourteen inches is the more desirable mode. Carrots, according to the practice of Mr. Burrowes, a celebrated Norfolk farmer, are fit for the first hoeing in five or six weeks. He leaves the crop in the ground until it is required in spring, except a sufficient quantity for use, in frosty or other weather unfavorable for carting from the field.

CARSE LAND—The term seems peculiar to Scotland, and signifies alluvial soil, caused by the rich deposits from the overflowings of a sea or river. The carse of Gowrie is one of the richest plains in Scotland. Another fertile vale with a deep bed of extremely rich earth, accumulated by the overflowings of the river Forth, is called the carse of Stirling; the same river has enriched the carses of Kippin and Polmaise. They are remarkable for bean crops, which grow to the height of six or seven feet.

CART—Under this head are many varieties, according to the uses for which they are required. The ponderous and costly English farm cart—itself a load—drawn by two or three horses, is, we think, one of the worst; for, independently of the difficulty of drawing the machine itself, if the carter should be careless, stupid, or drunk, the horses may be so mismanaged as to draw unequally—see *Draught*. The light Scotch cart is, perhaps, the most advantageous for general purposes; for drawing large stones, sacks of corn, and those substances which do not require close boarding, one-horse drays are the most convenient; these should be in length from the point of the shaft to the extreme end fifteen or sixteen feet as this length of leverage admits of easing the horse on rising and falling ground by the pressure of the hand at either end, and allows the load to rest without being at all disturbed, when the horse is unyoked, upon the two back ends of the shafts which form a fulcrum. As the load should rest on the axle, and not on the horse's back, a considerable length of body is desirable. Horses of very moderate size, overworked and underfed, draw from twenty-five to thirty cwt. on these drays, from Cork to Dublin; the coalmen constantly take loads of this weight from Castlecomer to Carlow, Kilkenny, and Leighlin-bridge, from having discovered the principle on which carts should be constructed and hung; on level ground the shafts should be horizontal. A donkey's cart conveys, with ease to the ass, double the weight which the now antiquated low Irish car on block wheels used to convey with great labour to the horse; though, to say the truth, the instinctive cruelty and avarice of man in many cases, give a much greater proportion of load than even the greatly improved construction of carts and roads will fairly allow — under the word *Draught* the superior advantages of light one-horse carts will be stated.

The cost of the Scotch cart is about £10; an improved Irish *car*, which answers all ordinary purposes, may be constructed at the cost of *£5*, of which the proportions are here given.



Dimensions.

	ft.	in.
Length of body -	5	3
Breadth do. -	3	3½
Diam. of wheel -	3	11
Length of shaft -	5	7

Scale, ¼ inch to 1 foot.

This car—when the tail-board is removed—on being raised from the horse's back, quickly discharges its load, and is easily replaced in its position; from its lowness it is very easily loaded. A moveable boarded frame can be attached, for the conveyance of potatoes and turnips, and a sparred one for loading sheaves or hay.

CATTLE—Under this head we include the family of the cow, or, more correctly, of the *ox*, which is the genus, and without occupying time or space with any observations regarding the natural history of this most valuable and useful animal, or the varieties—wild and tame—which exist in foreign countries, we shall confine our remarks to the principal and most desirable breeds in the United Kingdom, and for this purpose avail ourselves, especially, of the important information contained in the volume on Cattle, published by the Society for the Diffusion of Useful Knowledge. The most desirable points of a cow are there thus stated—

"A milch cow, good for the pail as long as she is wanted, and then quickly got into marketable condition, should have a long and rather small head; a large-headed cow will seldom fatten or yield much milk. The eye should be bright, yet with a peculiar placidness and quietness of expression; the chops thin, and the horns small. The neck should not be so thin as that which common opinion has given to the milch cow; it may be thin towards the head, but it must soon begin to thicken, and especially when it approaches the shoulder. The dewlap should be small; the breast, if not so wide as in some that have an unusual disposition to fatten, yet very far from being narrow, and it should project before the legs; the chine, to a certain degree, fleshy, and even inclining to fullness; the girth behind the shoulder should be deeper than it is usually found in the short-horn the ribs should spread out wide, so as to give as globular a form as possible to the carcase, and each should project farther than the preceding one to the very loins, giving, if after all the milch cow must be a little wider below than above, yet as much breadth as can possibly be afforded to the more valuable parts. She should be well formed across the hips and on the rump, and with greater length there than the milker generally possesses; or if a little too short, not heavy. If she stands a little long on the legs, it must not be too long; the thighs somewhat thin, with a slight tendency to crookedness, or being sickle-hammed behind. The tail thick at the upper part, but tapering below; and she should have a mellow hide and little coarse hair. Common consent has given to her large milk-veins; and although the subcutaneous, or milk-vein, has nothing to do with the udder, but conveys the blood from the fore-part of the chest and sides to the inguinal vein, yet a large milk-vein certainly indicates a strongly developed vascular system—one favourable to the secretion generally, and to that of the milk among the rest."*

To which we may add of our own observation a deep orifice where the milk-vein issues from the belly, and in circumference such as we may suppose to be formed by a large musket ball.

"The last essential in a milch cow that we shall mention is the udder, rather inclining to be large in proportion to the size of the animal, but not too large. It must be sufficiently capacious to contain the proper quantity of milk, but not too bulky, lest it should thicken and become loaded with fat. The skin of the udder should be thin, and free from lumps in every part of it. The teats should be of moderate size; at equal distances from each other every way, and of equal size from the udder to nearly the end, where they should run to a kind of point. When they are too large near the udder, they permit the milk to flow down too freely from the bag, and lodge in them; and when they are too broad at the extremity, the orifice is often so large that the cow cannot retain her milk after the bag begins to be full and heavy. The udder should be of nearly equal size before and behind; or, if there is any difference, it should be broader and fuller before than behind."*

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* "Cattle," Library of Useful Knowledge.

The same general form is equally desirable for bulls, making due allowance for the greater developement of muscle in the neck, greater length of brisket, and for such points as the masculine character of the animal implies; great size in the selection of the bull should not be the principal, though it is an important object, but the perfections of his points, all of which, by the way, do not appear until he has attained full maturity; *blood*, in the case of a very young bull, must be the standard of his value.

The description above given critically applies to the improved short-horn breed, which combines all the qualities requisite for the dairy and the shambles, which for a length of time were supposed incompatible. How this admirable breed has been produced is communicated in a very interesting detail, furnished to the editors of the work just referred to, by the late Rev. Henry Berry, who has been so remarkable for his agricultural acquirements. We can only give some extracts from it:

"From the earliest periods as to which we have any accounts of our breeds of cattle, the counties of Durham and York have been celebrated for their short-horns, but principally, in the first instance, on account of their reputation as extraordinary milkers. To recite their recorded feats at the pail, would be to invite incredulity; but it may be asserted, on the best evidence, that, taken as a breed, they have never in this particular been equalled. The cattle so distinguished were always, as now, very different from the improved race; they were generally of large size, thin-skinned, sleek-haired, bad handlers, rather delicate in constitution, coarse in the offal, and strikingly defective in the substance of girth in the fore-quarters; as milkers they were most excellent, but when put to fatten, as the foregoing description will indicate, were found slow feeders, producing an inferior quality of meat, not marbled or mixed as to fat and lean, and, in some cases, the latter was found of a particularly dark hue. Such, also, are the unimproved short-horns of the present day, and the distinction cannot be too frequently asserted, because they are, in many cases, considered as specimens of the improved breed, and have actually been resorted to in trials as to the comparative aptitude of animals to fatten—trials which it is evident they could not successfully sustain.

"A period of more than eighty years has now elapsed, since the short-horns, on the banks of the river Tees, hence called the Teeswater breed, had assumed a very different character to that contained in the foregoing description. In colour they resembled the improved short-horns, being occasionally red, red and white, and roan, though the last named colour was not then so prevalent as now; they possessed a fine mellow skin and flesh, good hair, and light offal, particularly wide carcases, and fore-quarters of extraordinary depth and capacity. Perhaps no closer modern resemblance can be found to the above description of the Teeswater breed, than Mr. Berry's bull presents; his dam was purchased by Mr. B. on account of the very few crosses that intervened between her and some of the best of the Teeswater cattle, to which he was desirous to go back on account of the extent to which breeding in and in has been carried. When slaughtered, their proof was extraordinary, and many instances are recorded of the wonderful weight of their inside fat."[*]

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* "Cattle," Library of Useful Knowledge.

Mr. Charles Colling, a cattle-breeder, greatly improved the Teeswater breed, which was too loose and disproportionate in form; by great care, through a cross with a celebrated bull called Hubback, smaller than the Teeswater breed, whose dam, purchased from a very poor man, had a strong disposition to fatten, which tendency her offspring Hubback inherited, and transmitted to his own progeny. About this time the celebrated Durham ox, (the produce of a common cow put to Favorite, the grandson of Hubback,) was produced, and his enormous weight—at one time 216 stone—set all the great cattle-breeders mad on the subject of fat cattle. Mr. Colling, by perseverance in judicious crossing with the polled Galloway, which, by their deep massive frames and short legs, tended to render the produce more compact, to bring them nearer the ground, and in a word, to render them most desirable both for the pail and the shambles, at length succeeded.

He was much favoured by circumstances in promoting his object, which was to take one cross, and then breed back to the short-horn—the only course, by the way, in which crossing can be successfully adopted. To breed from the produce of a cross *directly among themselves*, will lead to results which have induced many persons, without due consideration, to believe conclusive against crossing; but to take one cross, and then return and adhere to one breed, will, in the course of a few generations, be found to stamp a variety with sufficient certainty.[†]

Mr. Colling's short-horned bull, Bolingbroke, was put to a beautiful red polled Galloway cow, and the produce being a bull calf, was, in due time, put to Johanna, a pure short-horn—she also producing a bull calf. This grandson of Bolingbroke was the sire of the cow Lady, by another pure short-horned dam, and from Lady has sprung the highly valuable family of improved short-horns, at a single sale of which, in October 1810, Mr. Colling received £7115 17*s*. From the above origin various cattle have been bred by Lord Althorpe, Mr. Renny of Phantassie, and by Mr. Berry, whose stock is considered pre-eminent. Annexed is an engraved description of

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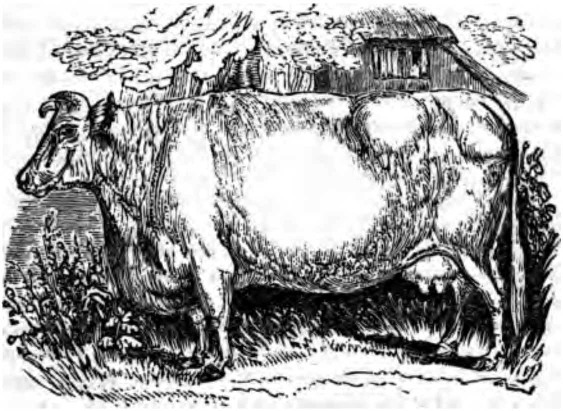
[*] "Cattle," Library of Useful Knowledge.

[†] It is confidently asserted that in all species of domestic animals, the seventh generation from the first cross will be of the pure breed; provided, that the male be always the same, or of the same genuine breed.

THE SHORT-HORNED COW.



On the importance of looking to the different purposes for which horn-cattle are required:

"It is unquestionably true, that every perfection in cattle—whether it be one of form, of quality, of flesh, of disposition to fatten, or to yield milk—can be promoted and retained, solely by the breeder's devoted attention to his particular object; and if one object be allowed of paramount importance in the breeder's estimation and practice, other objects will suffer in proportion as they are neglected.

"The improvement in the carcase of the short-horns has been so surprising, and so justly valued, that many persons have allowed that completely to occupy their attention, and the dairy has been disregarded. In such a state of things, every advance towards one point has been tantamount to receding from another; because the same proceeding which tends to enhance a particular quality, will also enhance a defect, provided such defect was of previous existence. This may be rendered more intelligible by a short illustration:—suppose half a dozen animals to be selected in consequence of their possessing a particular quality; which quality it is proposed, on a certain established principle of breeding, to increase and render almost permanent by their union: suppose the animals so selected to come from the hands of breeders who have neglected the milking property; the certain consequence will be, that the very union which developes and secures the desired object, will tend, on the same principle, to increase the defect as to milk; in short, it will render it habitual in the produce."

Mr. James Dickson, cattle-dealer, of Edinburgh, gives full information, in an admirable article in the 36th number of the Quarterly Journal of Agriculture, on the subject of crossing the short-horn with other cattle; we only regret that we cannot transfer much of his able comment to our limited space. He gives in a few words the rule which should be observed in crossing, which

"Cannot be too far promoted, provided the male parent possesses that high tone of blood which I have attempted to describe, and which it is necessary to preserve; to maintain judicious crossing there is a judicious and there is an injudicious mode of crossing; if the males of the first or subsequent crosses are kept for bulls, then the cross obtained from these bulls will be highly injudicious, and the deterioration in the breed, which some breeders dread from all crossing, after the first, will certainly be realised; but were bulls only of the best blood always used to promote a cross, the cross will certainly be an improved animal."*

"The objections which exist among breeders, for various and some cogent reasons, against crossing with the stocks of each other, unavoidably lead to the practice of breeding *in and in;* which, in case of any original deficiency of the milking property, must, unquestionably, go on to render that deficiency greater. It is hence evident that bad milking, in a breed of animals which were distinguished as good milkers, is not a necessary consequence of improvement in the animal in other respects, but a consequence of the manner in which such improvement is pursued. This the writer considers to be the reasoning properly applicable to the subject, which, happily, also admits of a satisfactory appeal to facts; and he is strictly justified in asserting that improved short-horns, inferior to none for the grazier, may always be selected and bred with the most valuable dairy properties. Perhaps a more plentiful and steady milker than the dam of Mr. Berry's bull never stood over a pail, and few such carcases of beef have been exhibited as her's, when an accident rendered it requisite to only half-feed her. The bull himself has an extraordinary disposition to carry flesh, and his calves are let down in the udders like miniature cows; in fact, all that bull's family are excellent for the pail, and the quickest possible feeders. The writer has known many instances of the highest bred short-horns giving upwards of four gallons (wine measure) of milk night and morning; and it is certain that attention only is requisite, on the part of the breeder, to perpetuate this quality in any desirable extent. While on this subject, it is proper to observe, that the excessive quantities of milk obtained from the unimproved short-horns are seldom or ever obtained from the improved; but a moderately good milker of the latter kind will be found to yield as much butter in the week as one of the former, the milk being unquestionably of a very superior quality; and indeed it was likely such should be the case, and that the artificial change in the animal economy, which leads to an excessive secretion of flesh and fat, should also be productive of other rich secretions. Within the last three or four years affidavits were sworn before a magistrate in America, that an improved short-horned cow, imported thither, produced at the rate of twenty pounds† of butter per week."‡

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* Dickson.

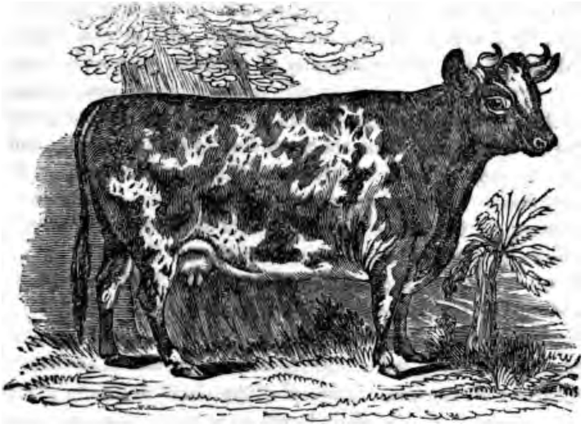
† The number of ounces to the pound is not stated, which leaves us in the dark as to the actual quantity. Though giving friend Jonathan full credit for his powers of amplification, and the great productiveness of his cow, we may, in the present instance, be satisfied that his pound of butter did not consist of the Ayrshire weight, twenty-four ounces.

‡ "Cattle," Library of Useful Knowledge.

With respect to this extraordinary breed, it is certain that they arrive at maturity much earlier than any other, are easily supported, and remarkable for their contributions to the pail, and yet have a remarkable tendency to fatten as soon as it is desirable to remove them from the dairy, and the bullocks are fit for the shambles—their meat having all the appearance of age even then—at two, or two and a half years' old.

The Ayrshire approaches nearest in qualities to the improved Durham; for the dairy alone, perhaps, this breed is superior. It is a curious fact that a cow of this breed, belonging to Mr. John Miller, nurseryman, of St. Ninian's, near Stirling, milked abundantly for several years successively, without having a calf. This cow was the first generation from a pure red bull of Holland, imported into Scotland by Lord Kaimes, and a west highland cow. This cross is said to be the genuine source of the celebrated Ayrshire cattle. This breed, now so numerous in Ireland, was introduced about twenty years ago, into the county of Waterford, by Mr. Colville, steward to the Duke of Devonshire, at Lismore. The original stock brought there, consisted of twelve cows and a bull; the cows were kept profitably at the pail during fourteen years, and then sold to graziers at £22 each. The original bull was killed when nearly four years old, and weighed 108 stone, and the flesh was remarkably tender. The calves, when dropped, sold at £6 each. Probably from the exceeding richness of the pasture, the progeny became too much inclined to fat, and too strong in the bone and coarse in the horn.

The Ayrshire Cow.



Mr. Fergusson, the successor of Mr. Colville, went to Scotland in 1837, having previously sold the entire of this stock, which had so much degenerated as dairy cattle, and purchased thirty-three queys and a bull, from the midland district of Ayrshire, and this infusion of new blood will, doubtless, be serviceable to the county of Waterford.

There are, however, several other very excellent breeds of cattle, though inferior to these short-horn; viz. the Devon, (the best for purposes of husbandry,) among the short-horned; and among the long-horns the Craven, or Lancashire, the Hereford and the Leicester, which has been greatly crossed with the Irish cow in parts of the county of Cork, in the counties of Tipperary, Limerick, Clare, Meath, Waterford, and other rich dairy districts of Ireland.

There are also in Ireland some good crosses from the Lancashire, having curled horns, directed at first outwards, and then inclined to the lower parts of the jaw, as if about to perforate it. It is unascertained whether the long-horn Irish are *natives* of Scotland or of England, but it is considered probable that they were introduced into the former country from Lancashire, where the quantity more than the quality of milk has long been the chief object.

The Kerry cow, almost the only aboriginal species, has been so much crossed with a better breed, that it is only to be found in the highlands of that county, whence droves of little stunted animals issue, like the human poor of the same district, to more fertile regions, where these diminutive creatures, being pastured for a season, and well housed during the subsequent winter, grow considerably, often weighing, when fat, from three and a half to four cwt. and prove good for the pail, in proportion to their size.

The *improved* Kerry, (for the native kind, at the best, is comparatively worthless,) like the Scotch highland cow, is the very description of animal for the small farmer and cottager, who require cattle of hardy habits, and a moderate capacity of stomach, with little fastidiousness of appetite. In elevated and exposed situations, where pasturing is the prevailing system, nature points out the advantage of having cattle furnished with thick shaggy hides, instead of a silky and smooth skin—though delicate treatment will generally induce this quality in any breed. A man accustomed to wear only a cotton coat, and silk stockings, in the climate of India, would feel rather uncomfortable in the same flimsy covering on a mountain in our United Kingdom in the depth of winter. The clothing which nature affords to cattle is always suited to the temperature of the climate in which they live. The same providence is observable throughout the vegetable world also, protection of covering being always afforded to plants, according to circumstances and situation. Several of the land proprietors and cattle-breeders of Ireland, like their brethren in Great Britain, have taken great pains to improve the breed of horn cattle. Colonel Conolly has crossed the Donegal mountain breed with good bulls, an greatly improved the stock upon his northern estates in consequence, In every part of the lowlands of Ireland some specimens of pure short-horn, or very good crosses of this breed may be seen with the principal gentry and graziers. Mr. Walker states:

> "That within the last ten years, the breed has been greatly improved by crossing with the Dutch, the Ayrshire, and the Durham; yet that the improvements are mostly confined to the gentlemen and large farmers, for the small farmers (who are the majority of the inhabitants) consider that the short-horns require too much care and feeding, and that their milk is not so good as that of the native breed."*

When speaking of the management of cattle in Wexford, he adds:

> "The farms are small, and the occupiers of them have little capital, therefore, except in summer, when grass is plenty, the cattle live poorly, and are exposed to hardships. For the same reason, the calves and young cattle are stinted in their growth; but this does not appear to injure their milking qualities. They generally go to the bull at a year, or a year and a half old, so that they come into the dairy at two, or rising three years old."

Mr. Dickson remarks:

> "Many people imagine that all the Irish cattle are coarse, but they are mistaken; most of them, indeed, which are brought from the north of Ireland, are coarse enough, and very inferior, in shapes, points, and quality; but the cattle from the southern and midland counties, are excellent, and well fed to great weights. They would be, no doubt, much improved by crossing, and for that purpose I understand many short-horn bulls have been imported into that country, in order to suit their fattening qualities for the English markets, which are now the great marts for the sale of their cattle. I have seen as well-fed beef in the Smithfield market of Dublin as that of London. I once saw in Dublin a lot of four-year-old cross heifers from a bull from the stock of the late Mr. Alexander Thompson of Laws, in Berwickshire, out of Irish cows; it was a very superior lot of cattle, and sold for £26 a head. I saw them slaughtered, and their average weight was eighty stones, some of them ninety; the beef was of very fine quality, and thick upon the sirloins and backs. There were other lots of crosses in the market, and the butchers and dealers seemed to like them very well. The facts which I have adduced in regard to the results of crossing, unquestionably prove, that in all situations where the pure bred short-horns cannot be most profitably maintained, such as in the upland districts, and coarse pasturage on inferior soils in the lowland districts, the cross between the pure bred short-horn bull, and the cow of any native breed, will yield more profit to the breeder than the continuation in the cultivation of the native breeds."†

Crosses should not be made between breeds of very opposite form and qualities; and all essential changes should be gradual, and continued for some generations before the desired improvement is perfected.

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* "Cattle," Library of Useful Knowledge.

† Quarterly Journal of Agriculture, No. 36.

A principal objection to all the coarse breeds is, that they are not advantageous for the butcher—they have too much bone and coarse meat.

Method of ascertaining the weight of cattle while living.—"This is of the utmost utility for all those who are not experienced judges by the eye, and by the following directions the weight can be ascertained within a mere trifle. Take a string, put it round the beast, standing square, just behind the shoulder blade; measure on a foot-rule the feet and inches the animal is in circumference; this is called the girth; then with the string measure from the bone of the tail which plumbs the line with the hinder part of the buttock; direct the line along the back to the fore part of the shoulder blade; take the dimensions on the foot-rule as before, which is the length, and work the figures in the following manner:—Girth of the bullock, 6 feet 4 inches; length, 5 feet 3 inches; which, multiplied together, make 31 square superficial feet; that again, multiplied by 23, (the number of pounds allowed to each superficial foot of cattle measuring less than 7 and more than 5 in girth, makes 713 pounds; and, allowing 14 pounds to the stone, is 50 stone 13 pounds. Where the animal measures less than 9 and more than 7 feet in girth, 31 is the number of pounds to each superficial foot. Again, suppose a pig or any small beast should measure 2 feet in girth and 2 feet along the back, which, multiplied together, makes 4 square feet; that, multiplied by 11, the number of pounds allowed for each square foot of cattle measuring less than 3 feet in girth, makes 44 pound, which, divided by 14, to bring it to stones, is 3 stone 2 pounds. Again, suppose a calf, a sheep, &c. should measure 4 feet 6 inches in girth, and 3 feet 9 inches in length, which, multiplied together, makes 16½ square feet; that, multiplied by 16, the number of pounds allowed to all cattle measuring less than 5 feet, and more than 3 in girth, makes 264 pounds; which, divided by 14, to bring it into stones, is 18 stones 12 pounds.—The dimensions of the girth and length of black cattle, sheep, calves, or hogs, may be as exactly taken this way, as is at all necessary for any computation or valuation of stock, and will answer exactly to the fore quarters, sinking the offal, and which every man who can get even a bit of chalk, can easily perform. A deduction must be made for a half-fatted beast, of 1 stone in 20, from that of a fat one; and for a cow that has had calves, 1 stone must be allowed, and another for not being properly fat."—CATTLE KEEPER'S GUIDE.

So much more depends upon the bull than upon the cow, on account of the large stock which will descend from him, that the greatest care should be taken that he possesses the excellencies of his breed; yet, though more attention in this particular is given to him than to the female, great care should be also bestowed upon the points and character of the cow, for who can expect a superior produce from a defective dam? When once perfection has been obtained in any stock—as in the case of the short-horns—by breeding closely *in and in*, as it is termed, a little fresh blood should be infused, but the bull should be of the same breed, though as little connected by consanguinity as possible, and from similar pasture, &c. *He should not be allowed to serve cows before he is two years old,* and he will be better at three. The heifer, even of the precocious short-horn breed, should not visit the bull until she is two and a half year's old, if justice be intended to her; for how can she perfect her own growth, if she is prematurely nourishing from her body the calf in her womb?

Bullocks should combine in their formation strength and activity of motion, with a tendency to fatten; but those of the short-horn breed, being profitable at the age of two years to the butcher, are consequently unprofitable for the plough or the cart. See *Ploughing.*

Bulls, however, of the improved breed, are so gentle that they may be very advantageously exercised moderately in farm-work; constant confinement (for they should not roam with the cows at pasture) is bad for them. As over-fatness sometimes renders them unfruitful, they may be put to the plough or cart when gentle.

The ordinary guide for ascertaining the precise age of cattle is the horn—which is also indicative of the breed; at three years old (this is laid down as a rule) the horns are perfectly smooth, after this a ring appears near the root, and annually afterwards a new circle; so that by adding two years to the first ring the age is calculated; but the contributors to the volume so frequently quoted, have clearly shown that this is a very uncertain mode of judging; "that the rings are only distinct in the cow;" and that "if a heifer goes to the bull when she is two years old, or a little before or after that time, there is an immediate change in the horn, and the first ring appears, so that a real three-year-old would carry the mark of a four-year-old." "In the bull they are either not seen until five, or they cannot be traced at all;" nor in the ox do they "appear until he is five years old, and they are often confused;" besides, "there is also an instrument called a rasp, which has been said to make many an arm ache a little before a large fair." Without any delusive intentions, however, an ugly set in the horns of young cattle is often remedied by filing a little off the sides of the tips opposite to the direction which it is desired that the horns should take. If they require a considerable set, it will be necessary, instead of using the file, to soak a cabbage stalk in boiling water, and to hold it on the tops of the horns for a moment or two, until they become flexible enough to take the intended direction; this effected, let the horns be cooled with an application of cold water, and they will remain in the position given. There is no pain whatever occasioned by this old woman's process, else it would not be referred to here.

Some men (occasionally for reasons best known to themselves) have an antipathy to horns altogether, and would even carry their dislike so far as to extirpate them from the brows of all their cattle; they can indulge their taste by paring off the tops of the horns when they first break through the skin.

Perhaps it is not generally known that the larger the horn, the thinner the skull.

The age is indicated with unerring certainty by the teeth, to those who have judgment and experience, until the animal reaches the age of six or seven; until two years old, no teeth are cast, at that age two new teeth are cut; at three, two more are cut; and in the two succeeding years two in each year; at five the mouth is said to be full, though not completely so until six, because until that period the two corner teeth (the last in renewal) are not perfectly up. The front or *incisor* teeth, are those considered, for a full grown beast has altogether thirty-two teeth.

The principal diseases of cattle shall be briefly enumerated, with the most approved preventives or remedies. The inflammatory fever known by the familiar name of the *black-leg*, (which rarely attacks any but young cattle,) is usually occasioned by over-feeding, and too sudden transition, when they are in a lean state, from poor to rich and succulent pasture, and occurs in spring or autumn, and which is so often fatal, is known by the following symptoms—a hard bounding pulse, quick fevered breathing, heavy, red, and listless eye, the neck extended, burning skin, the root of the horn hot, dry muzzle, expanded nostril, parched tongue, staggering in the limbs, or a projection of them from the body, as if to prop it up from falling, great debility, lameness in the hind quarters, murrain in the joints, and blackness; mortification ensues, unless the disease be conquered by timely and very copious bleeding—even to faintness—from the neck; if after the first bleeding the pulse continues hard and throbbing, the bleeding should be repeated, and a draught of Epsom salts, (one pound, or a pound and a half,) and an injection of oil in gruel should be administered; it is essential to free the bowels completely, and the medicine must be repeated until this is effected. This terrible disease, if allowed to make any progress, becomes quickly fatal; after suffering, perhaps two or three days, from foul ulcers, which spread every where, with offensive fluid from the nose and mouth, bloody urine, &c. the animal dies—a mass of putridity—unless the dressing of the sores, and the application of the medicines, with unremitting attention, shall have conquered the disease. The first good symptom will be, an abatement of offensiveness in the smell of the ulcers, which then begin to heal quickly; when putridity has assumed a decided character there is no hope. Setons in the dewlap are recommended as preventives.

INFLAMMATION OF THE BOWELS proceeds either from inflammation of the external or of the internal coat of the intestines; in the first case there is costiveness, in the other purging. When the disease proceeds from the first cause, it comes on suddenly—attacks strong middle-aged and working cattle principally, in hot weather, and after long drought. The symptoms are extremely similar to those enumerated in the preceding disease; the patient grinds his teeth and shows evident symptoms of great pain, and dies in convulsions, unless relieved in time. Copious bleedings, sufficient doses of Epsom salts, and injections of salts in thin gruel, are to be resorted to.

In the second case, the purging, unless very violent, will clear the stomach of offensive matter, which may have occasioned the disease, and, therefore, should not be stopped suddenly; starch in thin gruel, given in a clyster, as occasion may require, will probably relieve this affection; and draughts of a similar nature, combined with moderate aperients, will tend to allay the inflammation.

Colic proceeds from *flatulence*, arising from excessive quantities of green food; or from *spasms* in the small intestines, or irritation in the intestinal canal; in the last case bleeding should be resorted to, and purgative clysters of warm gruel and oil should be administered; in the other instance bleeding will probably be unnecessary, but clysters should be given, with aloetic tinctures.

> "Any aromatic drink will relieve it; but two drachms of chloride of lime dissolved in a quart of warm water, with an ounce of tincture of ginger, (or two drachms of powdered ginger,) and twenty drops of essence of peppermint, will form one of the most effectual colic drinks—moderate exercise alone, will sometimes expel the wind; should this, with the dose just prescribed, fail of effect, the purgative drink and clysters should be given; and warm mashes and good old hay should constitute the food of the beast for some time afterwards."*

Murrain—This is a very malignant and epidemic disease, generally occasioned by feeding in damp undrained marshy lands; incalculable numbers of cattle have been periodically swept away in different countries and districts, since the time that God specially punished the people of Pharaoh, by sending "a very grievous murrain," when "all the cattle of Egypt died." It has partly worn itself out, and from the greater care taken to prevent its ravages, and the knowledge of veterinarians, particularly in France, it is not now the scourge that it has frequently been. The principal symptoms are, abundance of gum in the eyes, a shivering of the limbs, a heaving of the flanks, and palpitation of the heart, difficulty of breathing, the mouth hot, the root of the horn cold, the excrement hard and dark-coloured, and sometimes liquid and black, and very offensive; fever thus marks the early stage, eruptions take place afterwards, and tumours (accompanied by great sensitiveness along the spine and over the loins) are perceptible to the touch in the fleshy membrane; there is also a cough through the course of, and previously to the development of the disease, increasing in violence. When the tumours appear, it is important that they should rise fully and come forward, for unless they suppurate and break, the animal has no chance of recovery; if the humours recede into his system, or even remain stationary, he will not recover.

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* Digest of directions given at length in "Cattle."

"The early stage of murrain is one of fever, and the treatment should correspond with this—bleeding. Physic should be cautiously, yet not timorously resorted to; for sedative medicines there will rarely be room, except the cough should continue; small doses of purgative medicine, with more of the aromatic than we generally add, will be serviceable, effecting the present purpose, and not hastening or increasing the debility which generally is at hand; but if the bowels are sufficiently open, or diarrhœa should threaten, and yet symptoms of fever should be apparent, no purgative must be given, but the sedatives should be mingled with some vegetable tonic. The peculiar fetid diarrhœa must be met with astringents, mingled also with vegetable tonics. In combating the pustular and sloughing gangrenous stage, the chloride of lime will be the best external application; while a little of it administered with the other medicines inwardly, may possibly lessen the tendency to general decomposition. The external application of it should not be confined to the ulcerated parts, alone, but it should be plentifully sprinkled over and about the beast; and the infected animal should be immediately removed from the sound ones." *

Blain—A disease of the tongue, arising from a little bladder growing on its root, against the wind-pipe, which swells so as to stop the breath, is indicated by the patient's foaming at the mouth, and hanging out the tongue. This malady is occasionally epidemic, and always contagious, though not communicable by the breath; and it is well ascertained that the infection has been in many instances conveyed to the incautious cow-doctor, from allowing the discharge from the mouth of the infected animal to lodge upon a sore, or very absorbent part of his skin. The means of cure, if used before there is any offensive smell from the saliva, or appearance of gangrene, are simple and generally efficacious.

The bladders should be lanced under the tongue and along the side of it from end to end, and salt should be applied, immediately. Nothing more in ordinary cases is deemed necessary. The ulcers will soon assume a healthy appearance; but if this treatment have been delayed, and if fever have set in, bleeding, purgative medicines, and injections, as in fever cases, may be required. If the disease have been neglected until ulcers appear, not only in the mouth, but in other parts of the body—between hair and

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* "Cattle."

hoof usually—a solution of chloride of lime continually applied, will be the best preventive of gangrene; bleeding, after the fever stage has passed, should not be repeated, for then tonics will be requisite. If the appetite be impaired, merely from the soreness of the mouth, sufficient supplies of gruel should be at hand for the sufferer to sip, or poured down his throat from the horn.

> "When poured down bodily from the horn, it will generally find its way into the rumen, and there it will be retained, and be in a manner lost; but when given from the small pipe of the pump, and not too strongly forced on, it will trickle down the gullet and be likely to flow on into the fourth, or true digesting stomach, and be converted into immediate nutriment."*

REDWATER is either acute or chronic. The former, affecting delicate cows and calves, is a disease arising in the kidneys, attributable, like other ailments, very frequently to atmospheric influences, combined with certain local peculiarities, or from the circumstances of situation and food. It is said that the dry and acrimonious matter deposited in copse pasture, when the leaves are falling, is very apt to occasion this affection, which is also produced in spring from some qualities in the buds. The most obvious symptom is the redness of the urine, which appears mixed with blood; if the complaint be neglected, it exhibits a deeper hue, the appetite of the beast fails, its strength decreases, the eye becomes heavy and hollow, and life ceases on the tenth or twelfth day at farthest.

Copious bleeding, in order to change the current of the blood in the system, is the first thing to be resorted to, and subsequently a pound of Epsom salts should be given, and at intervals of eight hours afterwards, the following mixture: Epsom salts, four ounces; nitre, one ounce; castor-oil, six ounces; gruel, one quart; until the desired effect is produced.

The chronic redwater, in which the colour of the urine is of a brownish red, is occasioned rather by derangement of the stomach, than by disease of the kidneys, and disappears without any particular care, farther than administering a mild purgative, if suitable food does not of itself relax the bowels, and give a healthy tone to the digestive organs.

BLACKWATER is said by some to be only a variety of the above disease, but in reality it is the last stage of it; if *purulent matter* be contained in the urine, the offensiveness of smell, and the blackness of the colour will testify that the noxious secretion has overcharged the vessels, and that *mortification* has commenced in the last stage of the disease. When the urine assumes a darker brown, or black colour, no remedy seems to have been found; the animal soon sinks beyond recovery, and he stretches himself out and dies.

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* "Cattle."

TUMOURS affecting the lymphatic glands in the throat, called *clyers* in parts of Scotland, have been noticed at considerable length by Mr. Dick, veterinary surgeon, in the twenty-second number of the Quarterly Journal of Agriculture; these he considers to arise in weak and predisposed constitutions, from atmospheric influence, and to be analogous to strangles in young horses, and, with rare exceptions, to attack only young cattle. Mr. Dick prescribes a comfortable byre and a nutritious diet, with tonic medicines, as the sulphate of iron, in doses of two drachms for a middle-sized two or three year old, once a day in gruel, or five grains of iodine in gruel, night and morning. The tumour should be laid open, if matter is to be felt, but if not, a blister should be well rubbed into the surface of the swelling, and repeated until there is either absorption of the swelling, or the conformation of abscess. Should this plan not succeed in raising an energetic action in the tumour, iodine in the form of ointment, (two drachms to four ounces of lard,) should be well rubbed into the tumour every day, until absorption of the humour takes place. If it is still found that the tumour resists these remedies, it should be freely opened with a lancet, (as there is always some matter collected in it,) and a little tow put into the wound twice a day, smeared with blistering ointment, or dipped in a strong solution of sulphate of copper.

THE MANGE.—This cutaneous malady, which originates in poor feeding, and is communicated by contagion very rapidly, first appears about the head and jaws, or the tail, and obliges the infected animal to scratch and rub against every thing in his way; it then shows itself along the back and behind the shoulders, and rapidly extends in every direction; the skin becomes tight and stiff, as if too small for the body. Our favorite authority on this head gives the following recipe:—

"Flowers of sulphur, 1 lb.; common turpentine, 4 oz.; strong mercurial ointment, 2 oz.; linseed oil, 1 pint. Warm the oil, and melt the turpentine in it; when they begin to get cool add the sulphur, and stir the ingredients well together, and afterwards incorporate the blue ointment with the mass, by rubbing them together on a marble slab."

COW-POX is an eruption on the teats, with which dairy-maids are familiar. It appears in two distinct forms; one of which is very mild and local, unaccompanied with fever; the pustules in this case dry up quickly, and do not affect the constitution; bathing them with warm water, or rubbing them with the following ointment, will cure them:—take an ounce of yellow wax, and three of lard, melt them together, and when they begin to cool, rub in well a quarter of an ounce of sugar of lead, and a drachm of alum finely powdered.

The other species of cow-pox, which has been introduced into the human frame, through the successful experiments of Dr. Jenner, exhibits larger and rounder pustules, with a little central depression; they are filled at first with a limpid fluid, which, by degrees, becomes opaque and purulent, and each of them is surrounded by a broad circle of inflammation. This is more decidedly a constitutional disease than the former. The cow exhibits evident symptoms of fever; she does not feed well; sometimes she ceases to ruminate; and the secretion of milk is usually diminished.

These pustules go through a similar process with the former ones; they dry up, and at length the scabs fall off, leaving the skin beneath, sound; but if they are broken before this, the ulcers are larger, deeper, of a more unhealthy character, and generally far more difficult to heal. This is the genuine cow-pox.

The treatment is nearly the same, except that, being accompanied by more constitutional derangement, an aperient is more necessary, and it may occasionally be prudent to abstract blood. The frequent application of Goulard's lotion, with an equal portion of spirit of wine, will, at least in the early stage of the ulcer, be preferable to the ointment; but, better than this, and until the ulcers are beginning to heal, will be solution of chloride of lime. If the teats are washed with this before the cow is milked, it will go far towards preventing the communication of the disease.

For the process of rumination, and the nature of the stomach, see *Feeding*.

CHAFF-CUTTER—So called because it cuts hay and straw to the *size* of chaff—is indispensable in a large farm establishment. This implement is either constructed with a good deal of expensive machinery, or of very simple mechanism; it may be made up at the cost of only £1, or £1 5s. A great saving is effected by the use of it.

CHALK—A white calcareous earth, abounding in many parts of England, but not found at all in Ireland, nor, we believe, in Scotland. It is of two kinds; one hard and dry, the other soft and greasy, and better for land than the former. Chalk is put out like marl from pits, without being subjected to the action of fire, but ought not to be applied to soil of the same quality; in a word, it is a very mild description of lime, and may be applied therefore in infinitely greater proportions; like marl, it is put out on the surface in large quantities, varying from 500 to 1000 bushels per acre. Its effects are similar to those produced by other calcareous substances, on coarse sour pastures, in altering the quality of the herbage, and calling white clover into existence, also in loosening and mellowing the particles of cohesive clay. It is evident from its bulk, that chalk can only be used with economy in the immediate vicinity of the land whence it is raised, as its cartage to any considerable distance would not be remunerative. It requires a great length of time to incorporate a dressing of chalk fully with the soil, and therefore the good effects of a heavy dose will last for many years, and it is unadvisable to renew the application before the lapse of twelve or fifteen years; as long as any of it remains in the land, to decompose the putrescible matter of it, the farmer will derive benefit from it, and experience will teach him at what period he should repeat the dressing. The usual mode of chalking land in England is as follows:—a spot is selected as nearly as possible in the centre of the field to be chalked, and a pit of about four feet in diameter is sunk to the chalk, if it be within the distance of twenty feet from the surface. If not, fresh pits are sunk, until the level of the chalk is reached within that depth. The pit is secured from slipping in, by a lining of rude basket-work. The party of chalkers usually consists of three men, whose tools and other machinery are very simple, consisting of a couple of wheel-barrows, a spade, shovel, and pick-axe, a jack-rowl on a roughly-formed frame, with a cart-wheel at one end of the rowl, which answers the double purpose of a fly, and a stop for raising up the earth and chalk, which is completed by means of a rope round the rowl, with a weight at one end to balance the empty basket or bucket, at the other. The man below, digs the chalk and fills the basket, and the two men above, wind it up and wheel it out. When chalk is found, the pit is sunk altogether from twenty to thirty feet, and then chambered horizontally in three separate directions, and these apertures are made large enough for the pitman to work in them easily, nor is there any danger, as in the case of marl, from the falling in of the undermined body of chalk, which has too much firmness and consistency to separate. One pit is sufficient for chalking six acres, allowing sixty cart-loads to the acre, and the cost is 7d. per load, all expenses included.

CHEESE—The method of making cheese in the districts of Kyle, Carrick, and Dunlop, in the county of Ayr, in the west of Scotland, is as follows:

The cows are brought in from pasture at six o'clock in the morning, and milked with all possible speed, in order to throw up a fine head of froth in the milking pail, which improves the quality of the milk in a very high degree. The milk-maids perform their work very quickly; one active girl being able to milk fifteen good cows within an hour. When the milking-pail is full, and contains as much as a stout girl can lift, it is strained through a hair sieve, laid upon a small frame made of ash, placed across a large tub to free it from any impurities. The entire meal of milk being in the tub, a wine-glass of rennet is mixed with it, (by stirring the milk round with a small wooden rod,) and a linen cloth is then thrown over the tub to prevent any dust from falling into it during the process of coagulation, which is generally accomplished in the course of twenty minutes. When the milk has thickened, it is cut in various directions, with a long knife, to accelerate the separation of the *whey*, or serum, from the curd. The whey is then lifted off gradually with a skimmer made of sycamore, and in form resembling a common plate. The removal of the whey gently from the curd, is considered a very important part of the whole process of cheese-making, and care must be taken not to remove the whey too quickly, (particularly if a weight be upon the curd to press out the whey,) for the whole of the rich part of the milk, or *butyraceous* particles will flow off with the whey, to the great deterioration of the cheese. When the greater proportion of the whey is removed, the curd is cut into large pieces, and put into a vessel resembling a milk cooler, perforated with many small holes in the bottom and sides, that the remainder of the whey may drain off. At this part of the process a *sinker*,[*] with a light pressure, is placed upon the curd. The vessel which is commonly used as the percolater, is the *chessel* or mould in which the cheese is afterwards to be formed, with a small weight on the top to press it gently. When the whey ceases to ooze through the perforations, the curd is put into another tub, and minced very small with an instrument called a cheese-knife, which is composed of two blades of a peculiar form, and a perpendicular haft, three feet in length. This knife from its peculiar construction is equal to six blades, and performs its work quickly, without injuring the sides of the tub, or staining the cheese by paring off any particles of the staves. A towel of strong coarse texture is put into the bottom of the chessel, and around the inside, with a sufficient length to overlap the top when heaped with the minced curd. The mould is then put into the press to receive gentle pressure for three hours, and then taken out and laid upon the sinker. The next process is to lift off the mould, and to put the cheese into a tub to be minced very small again. The curd is chopped again a third time, and then rubbed between the hands, and sprinkled with fine dry salt; then another dry cloth is placed in the mould, and every handful of the curd put into it is pressed down with both the hands, until the mould is heaped; the ends of the towel are overlapped, the sinker is applied to the top, and the mould is then put into the press with an increase of pressure.

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[*] The sinker is a round piece of white oak, two inches thick, with two cross-bars on the upper side, to prevent it from casting with the weight of the press.

The cheese is allowed to remain four hours in the press the second time, and is then taken out for the purpose of applying another dry cloth, but the process of breaking it up is not repeated. The cloths are changed regularly every four hours the first day, and six hours the second day. This part of the process is provincially termed *staning the cheese.* When the cloth is to be changed, the mould is laid upon the sinker, lifted up, and then warmed at the fire, to extract any damp which may have been imparted from the curd. Dry cloths must be applied in the same way every six hours after the first day, and the pressure increased in proportion as the cloths become dry, and continued so long as the cloth imbibes the least damp. It is indispensable to be thus careful in *staning* the cheese, for if one drop of the whey is left remaining in it, it will sour the whole cheese, and cause it to split and become full of jumpers or maggots, and putrify like rancid bacon. Every time the cloth is changed, the cheese is put into the chessel in the same way, except the last time, when the edge of the upper side is pared, and the cheese is inverted to make both sides equally smooth.

Some celebrated cheese-makers have their crest cut on a thin plate, and placed in the bottom of the chessel, above the cloth, while the concluding operation proceeds. The time commonly required to make a cheese is forty-eight hours in summer, and seventy-two in winter. The last time that the cheese is taken out of the chessel, it is termed *green* cheese; it is then removed to a dry and well-aired floor, where it must be turned every day, and rubbed with a clean dry linen cloth, for one month, which completes the process of cheese-making. When the atmosphere is moist, some prefer laying the *green* cheese upon smooth boards suspended by ropes, for fourteen days, until it consolidates, observing the same attention as to turning and rubbing it with a clean towel when it is removed to the smooth floor.

The process of making the four kinds of cheese, manufactured in Scotland, is exactly the same; the difference is in the component parts.

The second quality is termed *half and half*, and differs from the first in being only half cream. One meal is put into coolers for twenty-four hours, when the cream is taken off, and the milk is warmed to the temperature of new milk, then put into the tub containing the last meal of new milk; the whole is stirred round, and the rennet is then applied, as already stated.

The third quality differs from the other two in being without any portion of cream, and is termed *skim-milk* cheese. In making this, all the milk must be warmed to the temperature of new milk, for the rennet will not cause milk to coagulate when it is cold. This kind is only made in small quantities, where butter happens to be in high demand, for it is considered indigestible and unwholesome, in consequence of wanting the butyraceous element.

The fourth, and by far the most valuable quality, is made of ewe's milk, and termed *ewe cheese.* It is distinguished by a dusky blue colour, we suspect from the semi-vegetable pills which the sheep sometimes drop into the pail, in spite of the milk-maid's caution, and which also impart an aromatic and pungent flavour, highly palatable. This is made but in small quantities, in the extensive pastoral districts of Ettrick, Teviotdale, and Yarrow, in consequence of only three meals of milk being taken from the ewes, after the lambs are weaned. It is in high demand, and of admirable quality, when *genuine*—and not, as is frequently the case, made of equal quantities of the new milk of the ewes and *cows* mixed together. No *good* farmers will, however, manufacture ewe-milk cheese, which never compensates for the injury sustained by the sheep, in consequence of abstracting their milk, for this or any purpose save that of rearing lambs.

It is surprising that *prime* cheese is not made in Ireland; the exceptions only prove the general rule. This arises from want of experienced English and Scotch cheese-makers. The late Mr. Synge, of the county of Wicklow, with the aid of Gloucestershire dairy-maids, manufactured cheese of admirable quality.

Some years ago, Mrs. Aitkin, (a native of Carrick, in Ayrshire,) the wife of Lord Doneraile's steward, who had only one cow, in the county of Cork, made excellent cheese, superior to the common Cheshire, and repeatedly said that, if she had a sufficient number of cows, she would have made cheese equal to the double Gloucester, in consequence of the superior quality of pasture in her neighbourhood.

At Kippure, in the mountains of Wicklow, where the proprietor, George Moore, Esq., formerly representative for the city of Dublin, has made the most spirited improvements, the Scotch manager of his dairy cows, which are of a very diminutive breed, manufactures very good cheeses; and if the number of the cows permitted the use of cream alone, he would make cheese equal in quality to the Stilton; but he is restricted to new milk for his best samples, which are really rich and well-flavoured, especially when made of the *strippings* alone.

The price of English cheese varies from 12d. to 14d. per lb. in the Irish shops, because the demand for it is inconsiderable. This is double the price at which it is valued by the manufacturers in England and Scotland, where the consumption is considerable; and there is no doubt that, if in Ireland there were a supply of superior cheese at 6d. or 7d. per lb. there would be a demand for it, and consequently for *bread*, which it is so desirable to introduce, at least for one meal, to the tables of the poor. It may be said that the demand must precede the supply; this is generally true, but if a nutritive article of food were offered at half the present retail price—and we see nothing to prevent this—we think that an immediate demand would ensue, and that the manufacturing of *prime* cheese in Ireland would necessarily result.

The best kind of cheese for toasting is made, towards the end of harvest, when the cows browze at liberty in the stubble fields.

Rule to choose the best quality of cheese.—Taste it, and if the flavour is agreeable, take a small particle of it between your finger and thumb, rubbing it, and, if it feel quite oily, be assured that it is good. If a cheese is of a fine palmy yellow on the outside, and very oily, you may be sure that it is prime.

Cheese as well as butter-makers should ever bear in mind, that, to have cheese and butter of the first quality, in every respect, they should keep every article connected with the dairy in the very highest state of cleanliness. Every time that the milking-pails, hair-sieves, frames, coolers, tubs, barrels, churns, staffs, firkins, skimmers, chessels, knives, cheese-cloths, scrubbers, prints, &c. are used, care should be taken that they be well scalded with pure boiling water, and carefully dried with clean linen towels, and exposed, as long as possible, to the rays of the sun.

Cheese-Cloths are large towels to put inside the chessel while the cheese is *staning*. They are of home-manufacture, and should be of strong and open texture; every time they are used for this purpose they should be wrung out of boiling water, and dried in the sun, or before the fire.

Cheese-Press.—The primitive, and most simple, is merely a long timber lever, one end being placed in a hole in a wall; and frequently it is fixed to a bolt, or in the trunk of a tree. The sinker forms the fulcrum, a weight consisting of two or three undressed stones being placed on the other end of the lever.

A second kind is formed by a large square stone, suspended by a screw between the side-posts of a timber frame. The chessel is placed underneath it, and the stone is lowered upon the sinker by turning the screw to the left hand. The chessel is removed at pleasure by turning the screw to the right hand, which elevates the stone. To preserve the screw, a small block of timber is placed underneath the stone during the period that cheese-making is suspended.

The third kind—a timber frame, consisting of two perpendicular sideposts and cross top, with a parallel beam which is suspended from the top by two screws. The chessel is placed upon the beam, which is lifted up when the screws are turned to the right hand; consequently the *sinker* of the *chessel* is pressed against the cross-top, and *stanes* the cheese. When the chessel requires to be removed, the screws are turned to the left hand.

The fourth, and most approved plan, consists of a frame of cast-iron, with a perpendicular piston, flat below, to cover the sinker of the chessel. The piston is moved up or down by a small pinion, to which is attached a small ratchet wheel, and malleable iron lever, three feet in length. The lever is grooved in several places on the upper side to hold the ring of the weight, and for adding or reducing the power, in proportion to its distance from the ratchet wheel. This press is very effective: weight of it, 2 st.—price, £1 4s.—pressure, 20 tons.

CHESSEL.—The mould in which the cheese is formed. It is made of thick staves of white or American oak, bound with two strong iron hoops, to withstand the necessary pressure. It is perforated with many small holes in the bottom and sides, to let the whey drain out of the curd.

CHEWING THE CUD, or RUMINATING, (so called from *rumen*, the *paunch* of the stomach in cows, sheep, goats, hares, rabbits, and some other ruminant quadrupeds,) is the act of leisurely masticating in the mouth the food which has been returned from the stomach for this purpose.

If a ruminant animal ceases to chew the cud, immediate illness may be expected, as the digestive organs cannot act without this natural process. An animal lying at ease, and leisurely chewing the cud—which any fright or excitement would immediately check—readily brings to our imagination, a quiet and tranquil tobacco smoker, in the happy and composed state of the nervous system, which the moderate use of the fragrant weed undoubtedly induces.

CHICCORY, though a plant so little cultivated by us, is not without utility; it is a perennial well known in France as herbage for cattle, and in Germany and Flanders for its roots, which make a kind of coffee; with us it is known only as a sallad. A Scotch correspondent of the Quarterly Journal of Agriculture states, that even in ordinary soils, (calcareous soils are the best for it,) and with little manure, the stems, full of nutritive milky juice, will rise to six or seven feet in height; he recommends, as it is a perennial, and would interfere with regular cropping, that it should be confined to places inaccessible to the plough. "On waste corners," he adds, "near large towns, no plant cultivated in this climate will bring the cow-feeder nearly an equal return with chiccory; it should also hold a prominent place in the garden of every cottager in the kingdom, whether it be used as coffee by the family, or as green food by the pig or cow." Arthur Young raved of it, and said, "that upon blowing sands, or upon any soil that is weakened, poor, and wants rest, there is no plant that equals it."

The time for sowing it is May, and the culture is the same as for clover.

CHARLOCK, wild mustard, or corn kale, as it is sometimes called, is a most troublesome weed in corn and turnip crops; in drilled crops of any kind it can be very easily removed by the hoe, in the intervals, but it sometimes obtains a mastery which is almost invincible; it seeds so early that it is hard to extirpate it. By a course of fallowing and green crops only, can it be got rid of; coarse dry calcareous land, long under culture, seems especially favourable to it.

CHICKWEED indicates the recent application of the dung of animals; it is only troublesome where there is bad management, as it is quickly removed by careful tillage, or by the hoe, on its first appearance. Store-pigs devour it greedily, cows and horses eat it, but sheep are indifferent to it. The young shoots, when boiled, are extremely like spring spinach.

CHURN.—In large dairies the *plunge*-churn, which has the shape of a barrel on its end, is the best; the dasher being moved up and down by a lever, worked either by water-power, or by a wheel outside, connected with the churn by a shaft and crank; this wheel is turned, where water-power is not available, by a horse or ass. Those worked by a lever can be accommodated to any quantity of milk, by moving the churn-staff nearer to, or farther from, the centre of the lever, (which ought to have holes, or screws, for the purpose,) and care should always be taken that the head of the churn-staff should rise nearly to the surface of the milk. This is obviously arranged by lengthening or shortening the lever which extends or diminishes the stroke of the churn-staff.

Where the staff passes through the cover of the churn a small cloth should be tied round, to prevent the escape of any cream or milk.

Where there is a threshing-machine or scutch-mill, the machinery of a churn can be added very easily, and the power which works the greater, can at the same time keep the lesser machine in motion. For churning a small quantity of milk or cream, a churn broader at bottom than at top, with a perforated board, attached to a handle, moved up and down by hand, is the most common. The horizontal barrel churn, supported between two uprights, with arms inside, connected with an axle which is turned by an iron handle, is much used in small dairy establishments. The patent box-churn is worked in the same manner. Care should be taken to *remove and clean the axle after every churning*, else the horizontal churn is the worst kind. The highland peasantry in the county of Kerry, make use of a churn of sycamore wood, which contains about four quarts.

CLAY, argil, or alumen, an earth consisting of several varieties. See *Earths.*

CLAY-KILNS.—Let an oblong enclosure, of the dimensions of a small house, (say sixteen feet by eight,) be made, suppose upon the headland, whence the clay is to be supplied, with green sods or mud raised to the height of four feet; two narrow channels are next to be cut inside, from end to end, passing out through the sod walls, and intersected by two or more (according to the length of the enclosure) channels of the same kind; these are to be loosely covered with flags or flat stones. On the points where these flues cross each other, dry peat sods, furze, or other dry and combustible matter, are to be laid on, and covered with about an inch of clay at first. The flues, except on the weather side, are to be closed on the outside orifice, and not opened except as the wind shifts about. After a short time these kilns, if properly fed with dry sods or heath, will be strong enough in heat to burn stiff, and even *wet* clay, in small quantities at a time, but frequently renewed. As the inside fills up with burned clay, the outer walls must be raised and always kept at least fifteen inches higher than the burning heap, in order to prevent the wind from acting on the fire at top, and as the walls become consumed, the breaches must be made up, or rather new walls must be built. Thus the kiln may be enlarged to any size; and, after getting into proper heat, it will burn the largest lumps of stiff undersoil, continue burning for months, or while material can be supplied at the top, and can only be extinguished by the carelessness of the workmen attending it. New kilns can be continually added in length, if it is necessary to increase the area.

"The reason of raising the walls at the commencement only four feet is, that the firing may be more readily placed in it; but, during the burning they should be always kept eighteen inches higher than the centre of the kiln, in order that the wind should not have power on the surface. As soon as the kiln is strongly kindled, two flues should be stopped, observing always to keep those open which face, as much as possible, the windward point; should the kiln burn too strongly, one of these will be sufficient to keep open. It will often happen that the kilns will burn to a height of eight or nine feet; but it is no advantage to let them burn higher than seven feet, as the inconvenience of dressing them, when so elevated, adds too much to the expense.

"When kilns are well managed, one of the size I have described would be burned in six weeks, at the end of which time the walls become so torrefied as to become of equal value as manure; with the interior of the kiln, however, it cannot be expected that they will be in a state sufficiently pulverized to put out at the same time for a crop; it would, therefore, be advisable to have them broken down as soon as the kiln has burned out, and to mix and blend all together. About two months after this preparation, it will be in good order to put out for a green crop, but for a corn crop it should be in the highest state of pulverization. Calcareous earth is considered to be, by some scientific farmers, the best substance for burning, on the principle that the calcareous matter which it contains is reduced to lime in the process of torrefaction."*

CLOVERS—There are infinite varieties of these (which are of the genus Trifolium) enumerated by botanists. The red clover, (Trifolium pratense,) which will last for three years, if not allowed to seed, is the most valuable. The uses of this clover, either mixed with rye-grass, for meadow and pasture of one or two years' duration, or for soiling during one season, are so well known, that it is unnecessary to make any observations on it, farther than to recommend to every farmer the saving of his own seed, as in this case he cannot be deceived in its quality. Deception has often been practised in the manner of preparing clover-seed for sale in France and England, by rendering the colour bright, by some chemical process, which destroys the vegetative powers. The farmer, looking only to the appearance of the sample, often purchases but loss and disappointment.

About the middle of September the second crop of clover will have the ripe, brown, crispy appearance; let it then be mown, and carefully dried without much delay. The prime seed which the common flail beats out, will be a fair sample for the market, and the hulls themselves, if sown very thick, will yield a healthy and abundant crop; this, however, is a slovenly practice.

The summer in this climate, it is true, is rarely favourable to the saving of the seed; but, when it is so, nothing could promote good farming among the poorer farmers more than the *habit* of saving it, for they are often unable to purchase it, and, consequently, omit to sow it altogether, or else limit the quantity too much. 4 cwt. per acre may be fairly expected.

The *Trifolium incarnatum*, an annual, bearing a beautiful crimson blossom, is a native of the south of France, recently introduced into this country; the seed is sown as soon as possible after removing the corn crop, on stubble-land *in good heart*, ploughed very *lightly*, or merely scarified, for though this clover will succeed best on dry and gravelly soils, the land must be consolidated for its reception. Where more than one light ploughing has been given, it has failed altogether, although it has flourished in the headlands of the same field, which had been trampled by the plough-cattle. After the ground has been *scratched* for its preparation, the seed should be harrowed in, and then well rolled. Under favourable circumstances it produces heavier crops than the trifolium pratense, and is better than a crop of winter vetches, as the seed of these costs much more, while the produce is cut only once. The common clover is, however, in our opinion, a more certain crop. Yellow trefoil is one of the well-known biennial clovers; mixed with grasses it is excellent for pasture during two years, and if sown by itself, gives a very early supply of food to sheep and ewes in spring; on account of its short stunted stem it is, however, rarely sown in this way. It is quite unnecessary to sow white clover (which is perennial) as this is an indigenous grass which springs up freely on dry grass land, after any application of calcareous substances, or even after a top-dressing of the worst rabbit sand; indeed any top-dressing will cause its growth. The species of red clover known by the name of American cow-grass, is perennial, and therefore the best for land which is designed to remain many years under meadow or pasture; the flowers of this are paler than those of the ordinary red clover; the stems are not hollow tubes containing air, and therefore it is not dangerous for cows, by inflating them. Clover for soiling should be sown on extremely clean ground, and *most favourably* with *drilled* barley, after turnips or potatoes. Loudon says—

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* Borrough's on Green Crops.

> "It will grow vigorously from two inches deep, and it will grow when barely covered. Half an inch may be reckoned the most advantageous position in clay soil. A whole inch in what is loose or light. It is a vulgar idea, that small seed ought to be sparingly covered; misled by that error, farmers commonly cover their clover-seed with a bushy branch of thorns, which not only covers it unequally, but leaves part on the surface to wither in the air."

The quantity of seed to be sown must depend on the condition of the land, the presence or absence of grass-seeds, and whether the land is to be unbroken for one, two, or more years.

COLIC, in cows. See *Cows*.

COLIC, in horses. See *Horses*.

COLTS-FOOT—*Tussilago*—is a perennial weed, most difficult to be eradicated, and generally indicative of soil exhausted by tillage with insufficient manure. Professor Low says, that it is principally found on moist soils where marl abounds; it is, however, very common also on dry calcareous soils, if worn out by tillage. *Drill* husbandry and manuring will most effectually remove it.

COMFREY.—*Symphytum Asperrimum*, rough or prickly comfrey, or trottels, as it was called by Mr. Young in his Farmer's Calendar, was introduced into England from Caucasus and Siberia, in 1799, and has been brought into notice by Mr. D. Grant, a nursery-man of Lewesham who has reprinted and extensively circulated some letters on its use from the English paper called the Country Times. It was brought into Ireland about six years ago by Dr. Derenzy, who republished, in the 16th number of the Irish Farmer's Magazine, the letters of Mr. Grant. The plants are easily propagated by cutting the roots into small pieces, and planting them in drills, three feet apart, and one foot distant in the drills, well manured with good dung, at any time from October to April; it will indeed grow at any time, and once planted, it requires no renewal, and consequently should only be planted where the ground is not required for any rotation purposes. February and March are, however, the most favourable months, as the roots then shoot out. It may be cut about the time of flowering, and before coming into seed, the perfecting of which has a tendency to weaken all plants. It does not cause any ill flavour to milk, nor is it, like clover, dangerous to cows or sheep. Pigs prefer it to vetches. Dr. Derenzy is of opinion, contrary to Young's, that the herbage only is valuable, and that the roots are of no use, as food, for man or beast. Though it thrives in poor, dry, and exposed soil, it will probably not succeed in moist land.

As to produce, our obliging correspondent just referred to, states, that on the farm of the Rev. Henry Moore, of Carnew Castle, it produced, in 1835, the enormous quantity of 82 tons to the Irish acre, in three cuttings—viz. 1st cutting, the middle of April, 28½ tons. 2nd cutting, the middle of July, 31 tons. 3rd cutting, the middle of September, 22½ tons. Total 82 tons.

COMPOSTS.—Stable manure, in particular, has such a tendency to ferment, become mouldy, and burn up too rapidly when heaped together, that it is always desirable to remove it to the field where it is to be used, as it becomes *sufficiently* fermented, and to mix with it, in layers, such substances, (sods, the scouring of ditches, *peat*, the earth of headlands, &c.) as will check the *excess* of fermentation, prevent the volatile particles from evaporating, and, at the same time, absorb its gases and moisture. The heap should be turned until the whole is well combined, and in a fit state for application to the soil. The dung of the stable or farm-yard, in this way, will become more valuable than if allowed to rot too much, or put out in too fresh a state. Besides, the gradual removal, during winter, of dung to the field where it is to be applied, saves cartage in the busy season of spring. Dung, mixed with the scourings of ditches, fresh sods, bog earth, and herbage, produces a valuable compost, by dissolving the inert vegetable matter in those substances, and rendering them food for plants. Bog stuff is an excellent substance to place as a deposit for the absorption of urine, and other fertilizing and dissolving substances, and fresh stuff should be added sufficient to imbibe all the juices of the cattle-sheds. This mixture has been termed Meadowbank *middens*, from the writings of Lord Meadowbank on the subject. This, for clay land, is excellent manure.

Peat sods, or other undissolved vegetables, mixed with hot lime, makes an excellent compost, especially for clay lands; and, if used generally for potatoes, would, according to Mr. Blacker's direction, allow the farmer to apply his farm-yard manure to green crops for cattle-feeding. *But dung should never be mixed in the same heap with hot lime, which would dry up and destroy the juices that are so valuable.*

The admixture of lime with rich friable earth is injudicious, as it dissolves the vegetable substances which would be otherwise food for plants; but, united with clay, or comparatively poor soil, or inert, *undissolved* vegetable matter, such as is afforded by the scouring of ditches, old banks, the roots of docks and other weeds, &c. the case is very different. Here it brings into action matter previously useless, and in an unfit state for incorporation with the soil, and pulverises tenacious matter, which, combined in minute particles with the lime, becomes a fertilizing agent in the soil with which it is to be blended. The farmer who has a large quantity of *rich earth* at his disposal, if circumstances have prevented him from mixing it with horse-dung, will act much more prudently in carting it to his field, and spreading it over the surface, and harrowing or ploughing it into the soil, before or after he applies his lime, than if he were to mix it with lime on his headland.

Sea-weed and earth or sand, make an admirable compost; the salt and oils of the sea-weed are absorbed by the matter on which it is laid; nothing is lost, and the whole becomes a mass of putrid substances, which regale the nose of the passer-by. Too frequent turnings of such a compost is not desirable, as they occasion the premature escape of gases which it would be better to have disengaged in the field for which the compost is designed.

Compost made in the following manner, has been used very successfully in the county of Cork:—let a platform of sods or clay, the richer the better, be formed, about six inches thick, twelve feet wide, and as long as may be necessary for the extent of land to be manured. At one end of this let the first load of lime, fresh from the kiln, be placed about four inches thick. Let the lime be then not only slacked but moistened with a solution of rock-salt or any common salt in water, at the rate of 6lbs. of salt to each barrel of lime, pouring the solution, or pickle, gradually and evenly on the lime, as the latter is found to imbibe it. Then spread the lime, thus moistened, two or three inches thick on the platform, and cover it with four or five inches of clay. Let the second load of lime be laid on the platform near the first, and treated in the same manner. When the entire platform is thus covered, begin again with a second layer of lime: slack, moisten, spread, and cover it as the first, until it be also finished, and proceed in the same manner with a third and fourth layer. If the bed be not collected in one place, but deposited in a long row, as when the earth of a headland is used, one or two layers of lime and earth will be more convenient, and will be equally advantageous; when the whole is covered with earth, let the heap be cut down and well mixed, in which state it may be suffered to lie until a short time before it is used, when it should be again turned. The proportion of water in which the salt is dissolved, depends on the state of the earth or mould. If the latter be wet, twenty gallons of water, with 6lbs. of salt dissolved in it, is sufficient for each barrel of lime; if it be dry, half a hogshead of water to that quantity of salt and lime will be necessary. Forty barrels of lime, treated in this manner, is a full dressing for an acre of potatoes; half the quantity is enough as a top-dressing for an acre of grass land.

CORN—Criteria of the ripeness of.' On this head we give an extract of an article which appeared in the 22nd number of the Quarterly Journal of Agriculture.

> "It is a known fact, that the uppermost grain in every ear of corn of the culmiferous crops is first ripe; whereas, the undermost pod is first ripe in the leguminous crops. To ascertain when a corn crop is ripe, we have, therefore, occasion only to examine the state of the uppermost grain in the ear. But, on examination, we may observe the uppermost grain gone, and, besides, it is a tedious task to examine numerous ears of corn. Other marks, which are more easily observed, are equally indicative of ripeness of corn. The state of the straw is a very observable mark. As the uppermost grain in the ear is ripe before any other in the same ear, so the whole ear is ripe before the straw. Ripe straw, then, indicates ripe grain in the ear. But, if the corn is not reaped till the straw is wholly ripe, the grains will be more than ripe—they will be in danger of leaving the husk, and falling on the ground. In order to save the grains, it will be necessary to reap the corn before the straw is wholly ripe. But, in late seasons, the culmiferous crops die first at the root, and the straw becomes, of course, ripe before the ear. We thus see there is a greater difficulty in ascertaining when corn is ripe than, at first sight, might appear. There is another difficulty of still greater magnitude connected with this subject. When corn is ripe, the grain is ready to drop out of its husk. Agitating the straw will shake it out. This agitation may arise either from the wind, or in the act of reaping. The loss of grain occasioned by the wind is some-

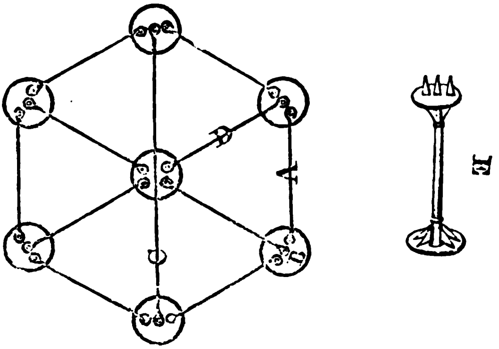
times very great. In 1812, the wind shook out, throughout Scotland, about 18 bushels of oats per Scotch acre. All the modes of reaping corn are attended with the danger of shaking out the grains. There are reapers with the sickle who have a provoking habit of switching about every handful of corn which they cut, and scattering around them the grains in profusion. Such reapers are expensive servants, though they should reap without wages. Some mowers with the scythe sweep around the swath with a jerk which whips out the grains, instead of carrying it steadily round on the scythe. Many bandsters have a trick of throwing the sheaf which they have just bound, up towards the stook, thereby thumping the grains out of it, to save themselves the trouble of bowing down, and carrying it afterwards to the stook. The best manner in which the reaping-machines at present in existence can be managed, will not insure the safety of many of the grains. Grains of inferior quality, or those which have not become plump by bad weather, are not so easily detached from the husk or flower-stalk by the wind, or in the act of reaping, as those which have arrived at perfection. Hence the greatest shakes, by wind or reaping, imply the loss of the finest, and, of course, the most valuable grain; and, to a smaller extent, the loss of the uppermost grain in the ear, is at the same time the loss of the finest grain in that ear; and the loss arising from the ordinary mode of reaping ripe corn, is greater in quantity, and of course in value, than one might, without reflection, suppose. The loss of the uppermost grain in the ear alone, and it is it which first decamps, is a loss of more than the seed, which is one-seventh of the whole crop; (supposing twelve millions acres of corn to be annually grown in the United Kingdom, this loss would be seven millions quarters of grain.) Grains of seed-corn produce more than their own number of straws, by a multiplication of stems, or by 'stooling,' as it is termed. Great care is, therefore, requisite in the reaping of corn. All the modes of reaping at present in use are, perhaps, nearly equally objectionable, in shaking out grains from the crops in the state of ripeness in which they are usually reaped. Our own experience would lead us to state that the scythe shakes out less than the sickle, as the corn is usually reaped with the latter instrument. Corn which is much laid with rain is apt to be stript of its grains with the rake of the scythe; but so is it also when reaped with the sickle, as the severed handfuls are separating from the laid corn. Bright sunshine, after heavy dews or rain, renders the grain very susceptible of being shaken with the least agitation by the wind or reaping.

"The only safe way then to avoid the shaking effects of the elements, or the act of reaping, is to reap the crops before they are quite ripe. Grain allowed to be too much ripened assumes a dull dusky hue in sample. On the other hand, grain not ripened enough, shrivels in drying. In both states it wants that brightness of colour which constitutes the characteristic of beauty in grain; and in both states it does not yield the quantity of farina which it is capable of affording when it is reaped at the proper period of ripeness. All the kinds of grain do not shrivel alike when too soon reaped. Wheat shrivels the most, and shrivels the more, the further it is from plumpness when reaped. Barley suffers next to wheat, and oats least of all. Oats, being covered with a stout envelope, apparently retain their plumpness under every circumstance, though their light weight in the hand betrays their worthlessness. But oats possess the property of filling and hardening in the stook, to a greater degree than the other kinds of corn.

" Barley withstands early reaping worse than wheat or oats. It not only shrivels much, but, when it is reaped with any green on the grains, it assumes a bleached white colour instead of the rich golden-yellow colour which it always exhibits when not discoloured with rain. Barley may be more safely allowed to stand till fully ripe than the cereal grains, as it is not easily shaken with the wind. The awns will be blown off before the grains. Its ear, lying at right angles to the stem, turns away from the wind like a vane on a steeple. When too ripe, however, it loses its bright golden-yellow colour for a smoky blackened appearance, its ear crooks down rigidly towards the stem, and will snap off altogether with the wind, or with violence.

" As a general rule for practice, it may be recommended to reap the culmiferous crop before the uppermost grain can be shaken out, either by the wind or in the act of reaping. When that period arrives, must be learned by the state of the straw. It is impossible to derive this knowledge from any written description, it must be acquired in the field, from personal observation, and afterwards confirmed by experience."

CORN STANDS—



A an iron bar—of thickness proportioned to the size of the stand and weight of corn to be supported—5 feet 10 inches in length.

B a cast metal cap—ten inches in diameter, with three metal pins, as represented in fig. E.

C an undivided bar—12 feet in breadth.

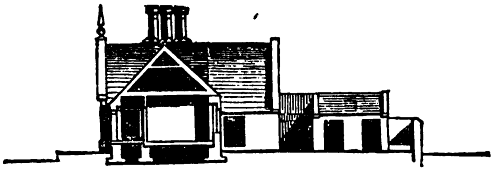
D one of the cross bars—the same as A.

E a supporter—2 feet 6 inches in height.

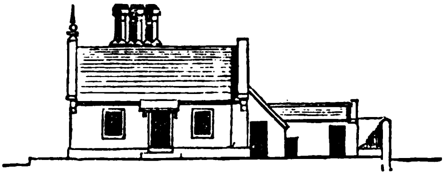
This engraving gives the plan and scale of a corn stand which a gentleman in the county of Kilkenny has invented. This stand would hold sixty barrels of wheat; much more than any small holder could expect to have; he may, however, diminish the *scale* of it so as to suit his quantity. The supporters are of cast iron, with circular feet and caps; they are complete guards against rats and mice. The cost of one of these is about £3.

COTTAGES.—We submit a few different plans, and ornamental elevations, of cottages, with upper stories; for he who, on a mud floor, lies on a level with his pig, is degraded below his rank in the animal creation, but when he ascends to a boarded chamber, he feels that he is a *man*. The first is from Mr. Smith's Prize Essay, and copied from the Quarterly Journal of Agriculture, in which the engraving is beautifully executed.

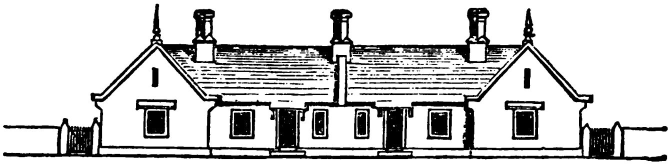
COMBINED COTTAGE FOR FOUR FAMILIES.



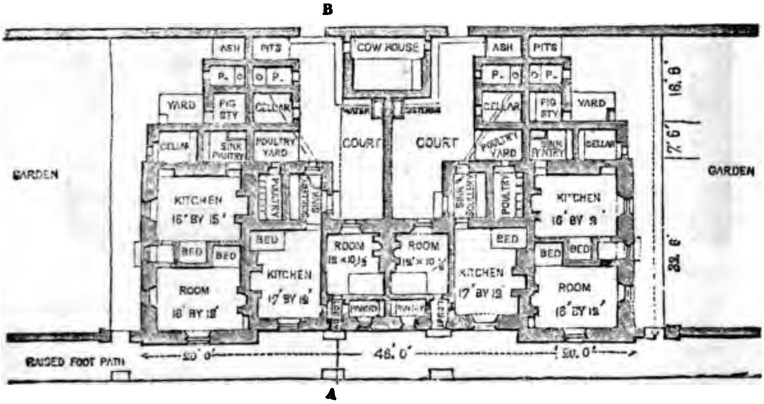
Section from A to B.



End Elevation.

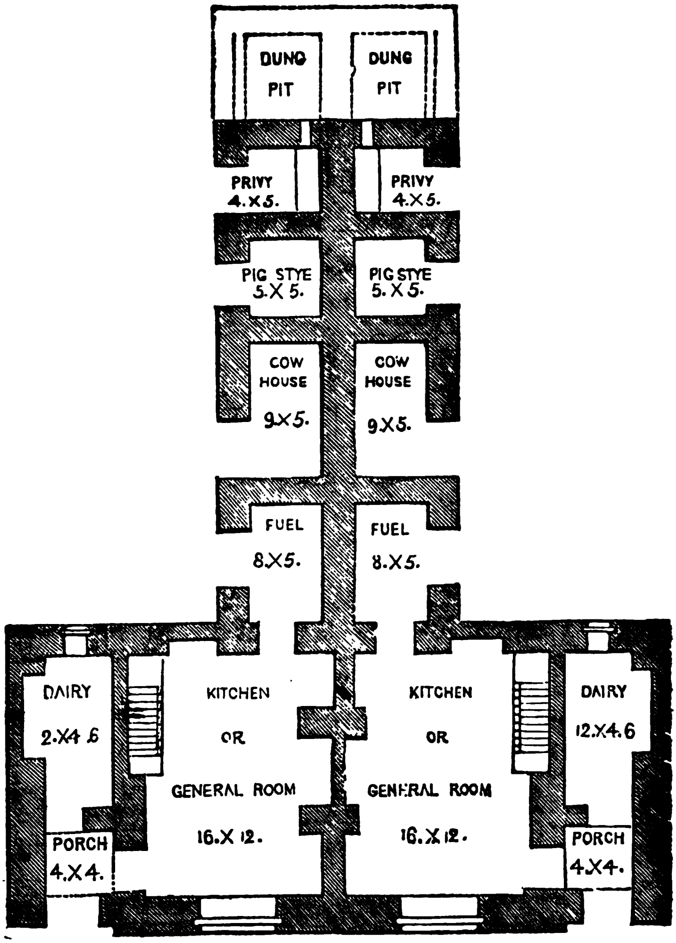


Front Elevation.



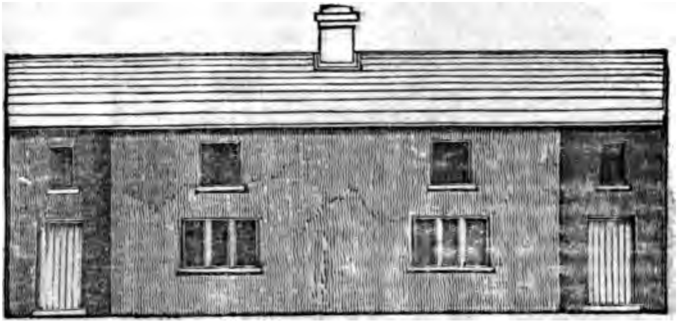
Ground plan of two cottages to be built at Glandore, for M. Yates and J. R. Barry, Esquires, at an expense of £86 17s. 4d.

No. 1.

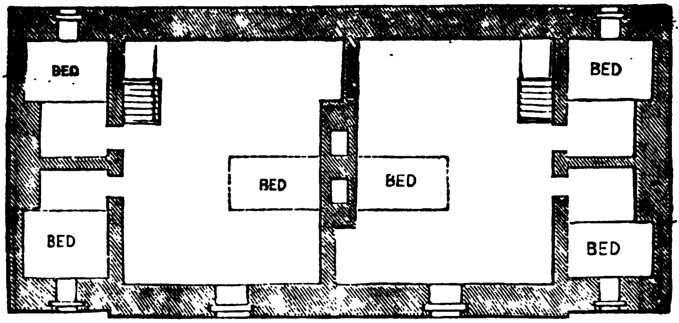


See plan No. 2.

No. 2.

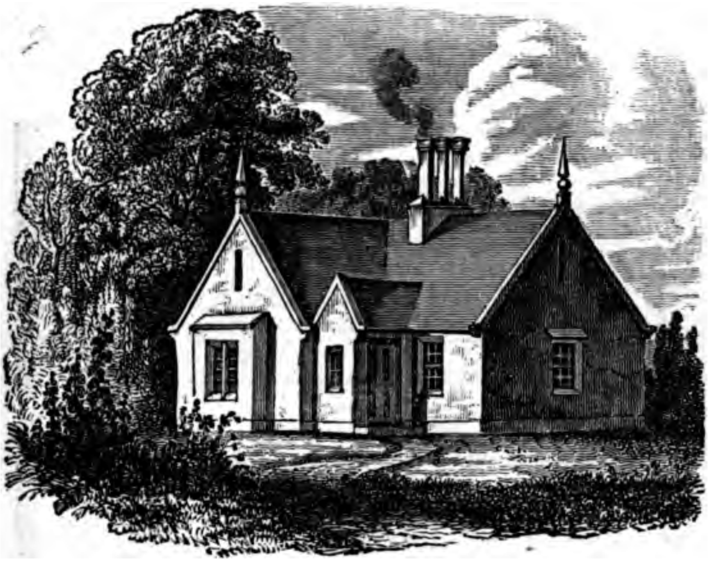


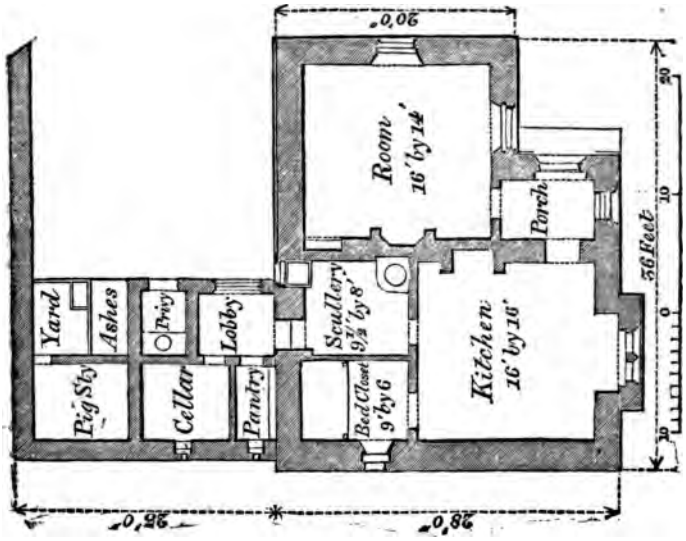
Plan of Bed-room Story.



Of late years the fashion of architecture so prevalent in the time of the Tudors has been revived, even in cottage-building, with very pleasing effect. It is, however, to be borne in mind that this ornamental style is expensive, and therefore inapplicable to those whose object is to provide plain and substantial habitations, at the least possible expense, for their labourers and dependents. We greatly question the discretion of those who place mere clod-poles in tenements which they have neither taste to appreciate, nor disposition to preserve in the degree of internal order and cleanliness which ought to correspond with the exterior appearance. Such cottages are only suited to a higher grade of society.

The parochial clergyman often sighs in vain for such a dwelling as is rudely sketched in the next page.




Room
16' by 14'
Porch
Scullery
9½' by 8'
Kitchen
16' by 16'
Bed Closet
9' by 6
Yard
Ashes
Privy
Lobby
Pig Sty
Cellar
Pantry
36 Feet
20
10
0
10

Stones and bricks are often too scarce and expensive for the poorer classes of farmers and labourers; but happily for them, clay walls, if properly constructed, and well plastered and dashed on the outside with lime-mortar, are cheap, durable, and warm. The mode of preparing mud walls is as follows:—a sufficient quantity of cohesive clay, free from any stones, being collected, the labourer digs it thoroughly, and renders it as fine as possible; when well saturated with water, he works it with his shovel until it acquires the consistence and toughness of dough. After lying eight or ten days, it should be again wetted sufficiently for use, a small quantity of sound chopped straw should be (for if this be long and stringy, the surface of the wall will not be easily dressed and polished afterwards) intermixed through the mass. The foundations of the walls should be of stone, or brick, two feet or more in depth, and two feet in thickness. On these, the mortar, being sufficiently turned and worked, should be placed in courses of two, or two and a half feet in height. At this level it has been recommended by a recent writer, who himself attached great *importance* to the invention, to bed into the mortar at the angles, single or double ties or braces, of any timber, provided its scantling is not less than two inches and a half, and to pin them into the walls with pegs about nine inches long.

The plate, fig. 1, which is taken from "the important discovery," explains the mode of binding these angles in each course, with double braces; and fig. 2 shows single ties at the angles, the cross walls, and

Fig. 1.

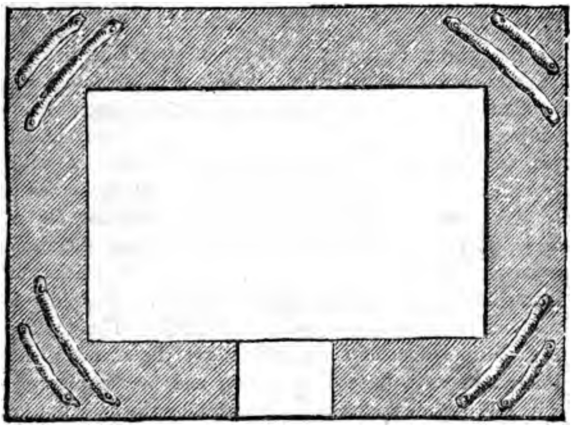
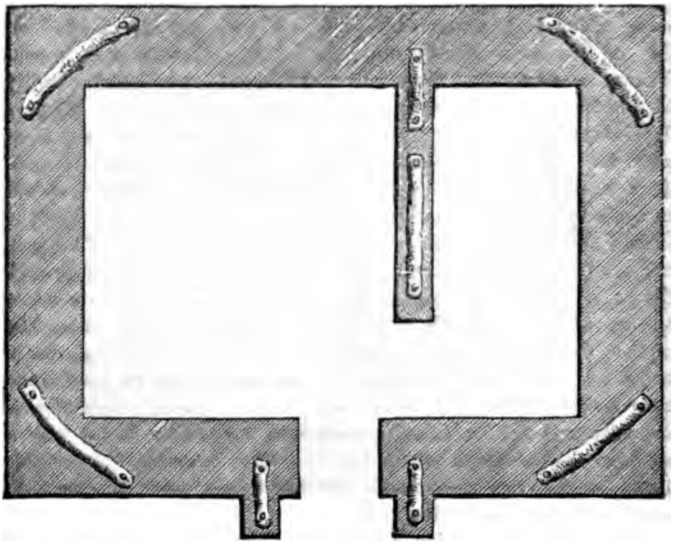


Fig. 2.



the porch walls. Each successive course of the mud material is to be connected by braces. This is certainly a good plan for keeping the walls together, at the angles, where they are seldom inclined to cohere firmly when built without these ties. The courses should be put on in dry weather, and only in such quantities as will consolidate perfectly.

Before the winter rains set in, the roof should be put on with double collars, and thatched with a considerably projecting eave, for the protection of the walls. Walls left unthatched, soon become materially injured. Common farm-labourers are in many places very expert in building these walls, and smoothing them at both sides perfectly with spades. If the plastering and dashing, or either, be carefully preserved on the outside, such walls will last for a long series of years. The floor should be laid on a stone foundation, as well as the partition walls, and covered with tiles, bricks, or clay and lime mortar, well tempered and evenly laid. Thatching is very defectively executed in most parts of Ireland. The thatcher, in order to save the labour of his hands, allows the *straw* to be almost rotten before he uses it, instead of wetting and pressing it well as *he* requires it. Wheat or *rye* straw, not beaten by the flail, but left in a *reedy* state, is better than any other kind of straw; but the true Irish *operative* thatcher will not admit this. He asserts, from ignorance of his trade, that reedy straw soon decays from exposure to the weather —that its unfitness for compression causes it to fail—that it cannot be made to lie as *close* as barley straw, which is generally preferred by those who do not understand the English method of preparing strong straw, by combing off the short straws, and lapping the layers of thatch, (tied down at narrow intervals by twine to the rafters,) so that every drop of water quickly runs off as from a bundle of quills. Thatch properly put on by an experienced hand, will last four or five times longer than the coat of barley or oat straw, beaten, pressed, and half-rotted, as it so generally is for the roof of the Irish cabin. The ordinary English mode of fastening down the thatch on the ridge with bent twigs, fancifully arranged, is very neat. Where this is inconvenient, a coat of mortar on the ridge, with pointed elevations of the same substance at the extremities, in the form of gigantic *comfits*, white-washed annually, has a very clean and decorative appearance.

"The Somersetshire mode of thatching is preferable to all others. It consists in using unbruised straw, provincially called reed, instead of bruised straw with the ears on it. The practice of Devon, Dorset, and Somerset, in this respect, is an example to all England, which we are surprised has not been more generally followed, as it lasts nearly as long again as common straw, and does not offer the temptation arising from grains of imperfectly thrashed corn, which induce mice and birds to infest the dwelling and make holes in the thatch. The mode of preparing the straw is simply to take a sheaf of wheat and to place it in a reed-press, made of two pieces of timber ten feet long, put on a stool, and having women to lay hold of the ears of corn, who draw out the straw and cut off the caps, and then bind up the sheaf for use. In this process women are usefully employed in wet weather, and the corn is much more easily thrashed when in short ears than when encumbered with the straw. The thatching work done with the reed will last ten years longer than that done with common straw, and as to the appearance there is no comparison; one is an elegant, neat covering, and the other a slovenly, ragged one. Many gentlemen, possessing fancy cottages and rural habitations, have been so struck with the neat and picturesque appearance of the cottages in the three western counties, as to have sent for persons to prepare reed for them in the counties where their dwellings are situate.

"There is another advantage also to a farmer, that the reed when carefully taken off hay or wheat-ricks may be tied up and used again a second year; and this in pasture countries, where straw is scarce, is no small consideration. It is usual for landlords to pay for the drawing of the reed by the hundred sheaves, in consequence of the superior durability of the work, as it is considered to endure beyond the ordinary term of a lease, and therefore contributing more to the interest of the landlord than the tenant."—*Baxter's Library of Agricultural and Horticultural Knowledge.*

COTTAGE HUSBANDRY.—The time was, when the peasantry of England were the pride of their country—a hardy, self-respecting race, depending on their own efforts, maintaining each man his own cow, and spurning at the notion of charity. But a variety of causes, the consolidation of small farms in particular, has nearly destroyed the English peasantry, and we must dread the result.

> "Princes and lords may flourish and may fade—
> A breath can make them, as a breath has made;
> But a bold peasantry, its country's pride,
> When once destroyed, can never be supplied."

In many parts of England, within thirty or forty years, several small farms of four or five acres, which supported large families in comfort, have been cleared of cottages and incorporated with large holdings of a much higher and wealthier (though not more useful) class of persons, and the ejected labourers have been long reduced to the degradation of receiving weekly alms; and he who once, in the full consciousness of honest pride, would have blushed at the acceptance of parochial charity, now claims relief, not as an act of gratuitous mercy, but as a right. He loses, consequently, all feelings of self-respect and moral energy, and becomes dissolute and degraded indeed. The agricultural labourer is a very valuable subject of the state, and the poor fellow, if thrown out of his own line of employment, has rarely any other to which he can turn himself. Tradesmen can save from their wages and purchase materials, and manufacture various matters for the support of their families, but he who has been bred to the spade cannot rise in the scale; he cannot obtain, under ordinary circumstances, even a patch of land for the employment of his time, even if he have saved any wages for the renting of it; to the cottager a bit of land is the *raw material* of his labour; yet where, at the present day, and under the present system of the great majority of landlords and landholders, can he supply himself?

The Labourers' Friend Society has done, and is doing, much in England. May God give a blessing to its efforts, and put it into the hearts of our own influential countrymen to act upon the same, or a similar plan!

In Ireland (potatoes being so generally the food of the population) a larger space may be advantageously afforded than is recommended by the patrons of the allotment system in England, where the use of the spade and hoe is so well known; but in all cases a fair proportion of the allotment should have garden vegetables and green food for the cow and pig, and accumulation of manure; and it is most injudicious to give as much land as will make the occupier fancy himself *a little farmer*, and tempt him to marry too soon, on the prospect of three or four score barrels of potatoes. The quantum of land should be subsidiary, not, as it too frequently is with us, the only resource of the labourer, who, if his potato-crop fails, "is poor indeed." The condition of England, in the beginning of the seventeenth century, was then critically what it is now in some parts of Ireland. An old writer thus describes it:—

> "The golden vale in Herefordshire being ye pride of al that country, yet (for want of employment) the plentifullest place of poore in the kingdom; yielding two or three hundred folde; the number so increasing—beggary will carry such reputation in my quarter of the country, as if it had the whole* by *halves.*"

Who among us does not compare this with the present condition of the labouring poor in the golden vale of Limerick? Herefordshire is now perhaps the most lovely and the most highly improved portion of England—full of gardens and orchards—the farmer's paradise. *Perhaps* the county of Limerick may, in future ages, be somewhat like it; but what would one of the Limerick *boys* now-a-days say to a proposal that he should cultivate carrots and *French beans* for his own table? What would he think of pear, and apple, and cherry-trees in an unfenced garden? Dine on French beans and three cubic inches of fat bacon! He could understand a bellyful of pork and potatoes—but two ounces of bacon and French beans! He would certainly—first taking his *doodeen* out of his mouth to give fair play to his feelings—laugh immoderately at the notion, and then doubt the reality of the picture presented to him.

The necessity of rejecting the urgently pressed labour of the poor who surround a gentleman's demesne, must be truly painful to a benevolent man, and if he possibly can, he ought, by appropriating little patches of land, to make those comfortable who have been born perhaps on his estate.

The poor man asks humane attention to his condition, and leave to work.

"He begs a brother of the earth
To give him leave to toil;"

and who, with ample space and means for the accommodation, can refuse the application, and lie down on his pillow with an easy mind? As mere farmers, we would not recommend minute subdivision of the land for the support of the poor, where no actual necessity exists for such appropriation; but where the pauper population is actually existing, no landlord, who regards the rights of humanity, should forcibly send adrift upon the world, to beg, or thieve, or die, those whom, by means of a little land cultivated by the spade, under the superintendence of an intelligent eye, he may render happy and comfortable.

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* Having the *whole* by *halves*, is rather Irish.

That small holders, under a good system of management, may become good farmers, is practically demonstrated in Belgium. The following portion of Mr. Nicholl's third report bears so directly upon the subject of cottage husbandry, and is so worthy of the attention of the Irish small-holder, in particular, that it must have place here:

"In the greater part of the flat country of Belgium, the soil is light and sandy, and easily worked; but its productive powers are certainly inferior to the general soil of Ireland, and the climate does not appear to be superior. To the soil and the climate, therefore, the Belgian does not owe his superiority in comfort and position over the Irish cultivator. The difference is rather to be sought for in the system of cultivation pursued by the small farmers of Belgium, and in the habits of economy and forethought of the people. The cultivation of the small farms in Belgium differs from the Irish—1st. in the quantity of stall-fed stock which is kept, and by which a supply of manure is regularly secured—2nd. in the strict attention paid to the collection of manure, which is most skilfully managed—3rd. by the adoption of a system of rotation of five, six, or seven successive crops, even on the smallest farms, which is in striking contrast with the plan of cropping and fallowing the land prevalent in Ireland.

"In the farms of six acres we found no plough, horse, or cart; the only agricultural implement, beside the spade and wheelbarrow, which we observed, was a light wooden harrow, which might be dragged by hand. The farmer had no assistance beside that of his wife and children, excepting sometimes for a short period in the harvest, when we found he occasionally hired a labourer at a franc (ten-pence) per day. The whole of the land is dug with a spade, and trenched very deep; but, as the soil is light, the labour of digging is not great. The stock on the small farms which we examined consisted of a couple of cows, a calf or two, one or two pigs, sometimes a goat or two, and some poultry. The cows are altogether stall-fed, on straw, turnips, clover, rye, vetches, carrots, potatoes, and a kind of soup made by boiling up potatoes, peas, beans, bran, cut hay, &c. into one mess, and which, being given to the cattle warm, is said to be very wholesome, and to promote the secretion of milk. In some districts the grains of the breweries and distilleries are used for the cattle, and the failure of the Belgian distilleries has been reckoned a calamity to the agriculture of the country, on account of the loss of the supply of manure which was produced by the cattle fed in the stalls of these establishments.

"The success of the Belgian farmer depends mainly upon the number of cattle which he can maintain by the produce of his land, the general lightness of the soil rendering the constant application of manure absolutely necessary to the production of a crop. The attention of the cultivator is always therefore especially directed to obtain a supply of manure. Some small farmers, with this view, agree with a sheep-dealer to find stall-room and straw for his sheep, to attend to them, and to furnish fodder at the market price, on condition of retaining the dung. The small farmer collects in his stable, in a fosse lined with brick, the dung and urine of his cattle. He buys sufficient lime to mingle with the scourings of his ditches, and with the decayed leaves, potato tops, &c. which he is careful to collect in order to enrich his compost, which is dug over two or three times during the course of the winter. No portion of the farm is allowed to lie fallow, but it is divided into six or seven small plots, on each of which a system of rotation is adopted; and thus, with the aid of a sufficient quantity of manure, the powers of the soil are maintained unexhausted, in a state of constant activity. The order of succession in the crops is various; but we observed on the six-acre farms which we visited, plots of potatoes, flax, rye, carrots, turnips, or parsnips, vetches, and rye, for immediate use as green food for the cattle. The flax grown is heckled and spun by the farmer's wife, chiefly during the winter; and we are told that three weeks' labour at the loom, towards the spring, enables them to weave into cloth all the thread thus prepared. The weavers are, generally, a distinct class from the small farmers, though the labourers chiefly supported by the loom, commonly occupy about an acre of land, sometimes more, their labour upon the land alternating with their work at the loom. In some districts, we are informed, every gradation in the extent of occupancy, from a quarter or half an acre, to the six-acre farm, is to be found; and in such cases more work is done in the loom by the smaller occupiers.

"The labour of the field, the management of the cattle, the preparation of manure, the regulating the rotation of crops, and the necessity of carrying a certain portion of the produce to market, call for the constant exercise of industry, skill, and foresight among the Belgian peasant farmers; and to these qualities they add a rigid economy, habitual sobriety, and a contented spirit, which finds its chief gratification beneath the domestic roof, from which the father of the family rarely wanders in search of excitement abroad. It was most gratifying to observe the comfort displayed in the whole economy of the households of these small cultivators, and the respectability in which they lived. As far as I could learn, there was no tendency to the subdivision of the small holding; I heard of none under five acres, held by the class of peasant farmers, and six, seven, or eight acres, is the more common size. The provident habits of the small farmers enable them to maintain a high standard of comfort. Their marriages are not contracted so soon as in Ireland, and the consequent struggle for subsistence among their offspring does not exist. The proprietors retain the free and unrestricted disposal of their property, whether divided into smaller or larger holdings. The usual rate of wages for a day labourer is a franc (or 10d.) a day, and the common rent of land is about 20s. an acre."

See *Allotment.*

COUCH GRASS, Quick Grass, or Scutch Grass, as it is called in Ireland, is one of the most persevering of the perennial weeds, and can only be got rid of, in any degree, by a course of drilled green crops, or fallowing. It is called *triticum repens* (creeping wheat) from its resemblance to that grain in its earliest appearance; it grows prodigiously in the ground, every joint being prolific; and, on account of its tenaciousness of life, should be burnt when collected by the fingers or the couch-rake.

COVENANTS AND LEASES—The terms of contract between landlord and tenant—the privileges allowed on the one part, and the obligations regarding rotations, &c. to be observed on the other—are very accurately defined, and generally fulfilled, in Great Britain.

The term of a lease varies considerably. In England, a seven years' lease is very common, and one of fourteen years is considered a long tenancy, and is rarely exceeded. In Scotland the limit is nineteen years—in Ireland, twenty-one years is the minimum of term. Leases there, for thirty-one years, with three lives, concurrent with, and in some instances *after* the termination of the years, are not unfrequent, and much longer periods—sixty-one and ninety-nine years—have been given; usually to the disadvantage of the landlord, and not always with benefit to the tenant. Such long leases, however, are now seldom given.

On many of the great estates in England, lands are let under a yearly tenancy, which differs from tenancy at will in no particular, except that, in the former case, if either landlord or tenant wishes to change or resign the tenancy, half a year's notice must be given, which formality is not required in the case of a tenant at will; and yet tenants so circumstanced are not afraid to expend capital on their farms; they have unbounded confidence in the hereditary probity of their landlords. There is in those instances a delightful reciprocation of confidence, highly creditable to the British character.* In Ireland this feeling of mutual confidence is almost unknown, and the circumstances of this country render it generally necessary that leases of at *least* twenty-one years should be given.

The peculiarities of the circumstances are these:—the tenant comes into possession of a farm worn out by the previous occupier, (who was under no obligations to manure, or observe any fixed rotations,) with dilapidated buildings, fences, &c. which, according to the custom of the country, the in-comer must put into repair, if he chooses to be comfortable. It would be the extreme of folly, therefore, in him, to expend his capital on the improvement of another person's property, without the security of a lease, of such duration, too, as will afford him a reasonable prospect of interest on the capital, *which the condition of the farm, in all particulars*, may oblige him to expend, and give him time to mature a good system of management. Years must elapse before he has remunerating returns, from the expensive operations of building, draining, and enclosing, &c. and he should be secured in his possession accordingly. There can be no stimulus to industry, nor independence of feeling, in that tenant who may, from want of a lease, be deprived of his farm by the caprice or cupidity of his landlord, or required to pay an advanced rent — an Irish premium—as the reward of his energy in ameliorating the soil of his farm. The force of public opinion, it is true, will serve, in most instances, to place a check upon the landlord, but he *may* prove indifferent to character, or be constrained, from pecuniary embarrassments, promises, and various similar engagements, to act ungenerously to an improving tenant; or the successor of a good landlord may be of very opposite character; no one can say at what moment that successor may come into possession; it is, therefore, a point of mere common prudence, to have a lease in the pocket. The possibility of risk of injurious treatment ought not to be run. A *good* landlord will delight in seeing his tenantry independent and thriving, and derive a degree of pride from the sight, unknown to the men of mere mercantile habits; and the *badly* disposed landlord ought to be bound by the ties of a lease, from the temptation or possibility of doing injury to his tenant, who ought to be permitted to reap the fruits of his industry with a *certainty* of undisturbed enjoyment.

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* It appears from answers to queries circulated by the Society for the Diffusion of Useful Knowledge, that on those estates where a mutual confidence has been long established between the landlord and his tenants, there is little perceptible difference between the cultivation of farms under lease and those held from year to year.—*British Husbandry, p.* 63.

> "In some places there is a kind of implied contract, that in case the landlord takes the farm from the tenant, he is to pay for the improvements. This, if acted upon, would be likely to produce an endless source of litigation. How are the improvements to be estimated? I believe the most liberal would be very unwilling to allow the full extent of what a farmer might fairly expect. Example and precedent speak with an authority not easily overcome. I would refer to what has been done in Roxburghshire, Northumberland, and Durham, and ask what has advanced these counties above the rest of Great Britain, for agriculture and the value of land? No doubt the spirit of the farmer, under the security of long leases. The great landed proprietors have neither expended their capital nor time in promoting what has so essentially advanced their property. They have had the wisdom and liberality to grant leases. Thence have flowed all the beneficial consequences to themselves and the public, and I trust they will ever continue stedfast friends to a system from which they have derived such important advantages."*

The interests of landlord and tenant ought to be the same, and they can never be happily combined unless the tenant has such a tenure, and on such terms, as will lead him to make those exertions which, while they serve himself, will benefit his landlord.

Under existing circumstances, however, the Irish landlord is placed between what he must consider the horns of a dilemma. If he gives no lease, his property is not improved, the tenant is disheartened, and has no spirit to apply the rules of good husbandry, and the tenements are neglected, to the injury of both parties.

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* Hints on Agricultural Subjects, by J. C. Curwen, Esq. M. P.

If he give a lease on equitable terms, he has the mortification of finding, in a great majority of cases, that the tenant registers a freehold to entitle him to the elective franchise—often very unwillingly—for the purposes, and at the instance, of a party opposed to his political views.

If a landlord give a lease, then, he confers a degree of power on his tenant, which, in most cases, he knows will be exercised to encourage principles and forward measures utterly at variance with those he conceives—it is not our province to decide upon the correctness or otherwise of his opinion—best calculated to promote the real interests of Ireland, and the integrity of the empire.

If he declines to give a lease, distrust arises, and the landlord suffers in his pecuniary interests; for, in this case, the expenditure necessary for the perfect cultivation of the ground will not be hazarded.

In England and in Scotland the landlord bears the principal, if not the entire, expense of preliminary labour on a farm; he builds the houses, and the tenant has only to keep them in fair repair—and even this obligation does not always rest upon him; his course of husbandry is merely the continuation of that of his predecessor's; there is no outlay of the tenant's capital at starting, as is necessary in Ireland; and this is the true cause of the comparative indifference to leases on the part of some English and Scotch tenants; but in Ireland, now, as in Scotland not many years ago, leases are essential to the interests of both the parties concerned, and without the security which they afford, much land, that would otherwise be in good tilth, will be left uncultivated. Nor are grazing farms exceptions to the general assertion of the necessity of leases, for the tenant who has no certainty of possession beyond a year, will never go to the expense necessary for improving his live stock, a matter so essentially important, whether considered with reference only to the reciprocal interests of landlord and tenant, or to those of the empire at large. But, even with regard to the most fertile and best cultivated parts of England, leases are *desirable*, both for landlord and tenant. This will appear, first as regards the landlord, from the consideration that where farms are held from year to year, the rents are low, and there is a perpetual drain upon him for repairs and improvements, which, under a lease of reasonable duration, would fall upon the tenant; besides, he will hardly expect, under such circumstances, to have so enterprising and wealthy a tenant, as he might have, were he to grant a less fugitive interest in his land, for " a person of good capital will, like every trader, regard as a benefit, the power of carrying on his business undisturbed, and will set a pecuniary value on security and independence."* Then, as regards the tenant, besides the *feeling* of insecurity, which, after all, he must experience, more or less, if he holds at will, prudence will restrain him from laying out his capital in the most advantageous way, and he will find his operations confined within too narrow a course, and unprofitable limits.

If then it be admitted that leases tend to the interests of the contracting parties, and the advancement of agriculture, it is only now to be considered what the term of a lease *ought* to be.

Now this must altogether depend on local circumstances, the habits of the neighbourhood, the condition of the farm, the amount of capital requisite, and on the important point, whether this capital is to be mainly advanced by the landlord or the tenant. A fourteen, or even a seven years' lease, may be sufficient in many parts of England, where ancient custom has regulated the system of letting, so that it is perfectly understood, and fairly acted on; but in Scotland, and still more in Ireland, the shortest term of a lease ought to be twenty or twenty-one years, and with no other covenants than will restrain the tenant from following rotations decidedly bad. The tenant should be allowed much discretion in the selection and arrangement of his crops, according to seasons, markets, &c. provided that two corn crops are not allowed to succeed each other, and that he manures a certain proportion—a fourth or fifth—every year, and lays down a defined area with grass seeds, to be broken up again in turn if he chooses.

The covenants sometimes introduced into English leases are as much too strict and vexatious, as they are too lax and vague in Scotland and Ireland. In Ireland the only usual restriction, and this rarely acted upon, is against paring and burning the surface. Where a long lease is given, the landlord may leave the management to the tenant, who, for his own sake, will treat the land in the best way within his power, and he should only be restricted as to crops and manuring, *in the concluding years of his lease;* and in all circumstances, "leases should rather contain *that which a tenant shall not do,* than prescribe what he should perform."

In Ireland the covenants are seldom more than the reservation of mines and minerals to the landlord, and sometimes a prohibition against burning the soil. As to the course of husbandry to be followed, and the quantities of manure to be given, the tenant is left entirely to his own discretion, which he so abuses as to leave his farm, on the expiration of his lease, (if he be not certain of its renewal,) utterly effete. A *native* of those counties in which agrarian outrages so continually occur, and where no new tenant can by any means be introduced without the assurance of being assassinated, by way of welcome, would be amazed on hearing read such a catalogue of covenants as are constantly entered into and observed in England, with a view to the interests of a new tenant, on the expiration of the lease, if differences of any kind should arise to prevent a renewal of the contract.

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* Quarterly Journal of Agriculture, No. 6.

We can well imagine the *hospitality* and *good feeling* with which one of the Limerick "boys," towards the conclusion of his lease, would allow the in-coming tenant to sow clover or other seeds, upon the barley and oat crops, and would set about harrowing them in for him *gratis*, and with what *care* he would prevent cattle from feeding off the young clover leys after harvest, lest this should injure the crop for his successor.

The following are the actually existing or suggested covenants in a lease in the county of Norfolk, as detailed by Mr. John Drew, in his essay on Norfolk husbandry, and taken in part, as he admits, from Mr. Marshall's rural economy of Norfolk:

"In Norfolk, and many other counties, the out-going tenant quits at Michaelmas; and leases, except of very small occupations, are general. The out-going tenant, according to my view of the matter, should receive the full value of his hay and turnips; the number of acres of the former to be mown, and of the latter to be sown in the last year, being regulated by his lease. The in-coming tenant pays for threshing the crop, and carries it all to market, not exceeding a certain distance, (which may be regulated by the principal market-town in the neighbourhood, if not more than fourteen miles distant,) for which he is allowed the *straw*, *chaff*, and *colder*.

"Well managed turnips have been valued as high as four pounds per acre to a tenant, half of them being Swedes; and under this system it becomes the out-going tenant's interest to manage them as well in the last year, as if he was to sow them for himself, and what a favourable appearance it gives to the land for the purpose of hiring; an appearance, too, founded on substantial tillage and manuring.

"I shall now proceed to give what to me appear not ineligible covenants, neither bearing too harshly upon the tenant, nor unduly infringing upon the rights and privileges of the landlord. I will suppose the farm to consist of five hundred acres, three hundred and fifty arable land, and the remainder old pasture and meadow; the soil on two hundred acres of the arable land is strong and good, but requires draining; the remaining hundred and fifty acres lighter, but much in want of claying.

"1st—The landlord agrees to let certain premises, &c. for a term and rental agreed upon.

"2ndly—To put the house, buildings, gates, and fences, in tenantable repair.

"3rdly—To allow rough materials for keeping the same in repair, (neglect or wilful damage excepted;) to furnish ladders for the repairs, and pay half the workmen's wages, whilst about such repairs; to find proper wood for gate-posts, stiles, and palings.

" Reserves all minerals and fossils, marls and clays, with liberty to work mines, quarries, and pits, and to burn lime dan bricks upon the premises, and to carry away same, (allowing tenant clay and marl, in any quantity deemed requisite for his farm,) liberty to view premises and do repairs, lay materials, &c.; right to alter roads, and inclose wastes. All timber and other trees, and all such underwood and hedgewood as may not be wanting for the purposes of draining, hedging, or burning lime, clay, or mould for manure, (and a specified quantity for fuel for the tenant;) full liberty of planting trees in hedges, and on banks, and to take a certain number of acres of land for the purpose of planting, upon giving twelve months' notice; allowance for rental, and any recent improvements thereon, such as draining, claying, &c. to be named by two arbitrators. Liberty of sporting, and all other customary covenants.

" The tenant agrees

" 1st—To pay the stipulated rent by two equal half-yearly payments, but not to be liable to an execution till the end of thirty days after the rent is due, and to pay the last half-year's rent three months before the expiration of the time.

" 2ndly—To do the necessary carriage for repairs, (distance to be specified;) to furnish wheat-straw for thatching, and to pay half the workmens' wages, and find them with small beer, whilst doing such thatching.

" 3rdly—To do each and every year, excepting as hereinafter specified, three hundred rods (or one-tenth of the whole) of ditching, five feet wide, three feet and a half deep, and a fourteen inch bottom, (landlord or his agent to set same out, if landlord deem it necessary,) and five rods of underdraining, none of which to be less than twenty-six inches deep; an allowance to be made by landlord or in-coming tenant, for all drains made in the last seven years of the lease, at the rate of a deduction, for each year, of one-tenth from the original expense. No ditching to be done in the last year of the lease, unless the landlord consents to pay for same at the usual rate of the country.

" 4thly—To carry out from pits yearly and every year five hundred loads of clay or marl, (or where only chalk or lime can be had, a proportionate quantity of those,) at the rate of thirty bushels to each load, the same to be laid and spread in a husband-like manner, at the rate of fifty loads, at least, per acre. To be at liberty to open fresh clay, marl, or chalk-pits, where necessary and convenient, and to be allowed for all clay and marl that may be laid upon the land, during the last seven years of the lease, (but not exceeding five hundred loads annually,) at the same rate as for under-draining.

" 5thly—To protect by hurdles or bushes, all young quicks, or other young hedges exposed in spring or summer to the bite of sheep or cattle, landlords furnishing the quicks for new fences.

" 6thly—To make, and pay for making, all such gates as shall be wanted during the lease; to hew, and pay for hewing, all necessary gates and gate-posts, hang and put down same, and keep old gates in repair, at his own expense.

" 7thly—To farm the lands in a husband-like manner, and to pursue the following mode of cropping: one hundred acres of turnips, fifty of beans or peas, which said beans or peas shall follow turnips, fifty acres of barley or oats, which shall likewise follow turnips, and be laid down with clover, trefoil, or other mixed seeds, and one hundred acres of wheat, fifty acres of which wheat shall be drilled or dribbled on clover lays of one year, and fifty acres on bean and pea stubbles. (Of course the particular mode of cropping just laid down, is only adapted to strong good lands, and superior light soils; for inferior lands it must be varied materially, beans altogether excluded, and the clover and other artificial grasses must continue in lay two years instead of one.)

"To mow in the last year not more than thirty acres of clover or trefoil, and twenty-five acres of grass, and not to leave more than thirty tons of old hay, clover, or trefoil.

"To consume on the premises all the hay, straw, and other stover, (except as is excepted in the last year,) and not to carry off, or allow to be carried off, any dung, muck, mould, clay, or marl, under a penalty of five pounds per load.

"Not to stock any part of the premises with rabbits, nor to suffer swine to go loose without being properly rung.

"To permit landlord, or *in-coming tenant* (in the last year) *to sow clover or other small seeds upon the barley and oats, and to harrow them in gratis for him, and not to feed off the young clover lays after harvest.*

"To lay up in the usual barn and rick-yards, the crop of corn of the last year, and to thresh the same in proper season, and in such manner, and in such quantities, that the straw, chaff, and colder, *shall be as little injured as possible;* in consideration of which, the in-coming tenant or landlord to remove the ricks to the barns, pay for dressing and threshing the same; and to carry out all the corn, not exceeding the distance of fourteen miles, but to be allowed tolls, and porterage, and not to carry less than ten quarters at each load.

"Tenant to be allowed the use of the barns and corn-rick yard, till the first of July next ensuing the end of his lease.

"To preserve the game and fisheries to the utmost of his power, during his lease.

"The value of the hay and turnips to be settled by two arbitrators, one to be chosen by each party, and the amount to be paid in Michaelmas-week, previous to tenant quitting."

In a word, Covenants in all cases must be regulated by the nature of the soil, the powers of the landlord, the facilities of manuring, the improvements required, &c. &c.

COWS. See *Cattle.*

COW-HOUSES—or Byres—should be so contrived as to have a passage in front of the cattle for depositing food. Where the houses are of a sufficient breadth for a double row of cattle, opposite each other, the passage should be in the centre of the house, and between them. In single sheds a rack and manger for each cow may be easily formed, in a recess in a front wall, with falling boards on the outside, which, when raised, afford the facility of depositing hay, or straw, in the rack above, or turnips, &c. in the manger beneath. These falling doors are divided by hinges into two parts, the upper, when closed, forming the back of the rack; the other that of the manger. For dairy cows, fed on steamed food, or mashes of any kind, the mangers should be moveable for the purpose of being frequently scoured. The urine should be conducted by a gutter into a tank, from which it should be pumped, or by some means taken out, for watering land, or admixture with earth, sods, weeds, &c. &c. The loss sustained by the flowing off of liquid manure into open drains and channels for rain-water, is incalculable. Byres should be kept very clean, and amply supplied with fresh litter for the cattle.

CROPS, ROTATION OF—This must depend on the nature of the soil, and local circumstances. Where a convertible system is to be regularly pursued, the rotation should be nearly as follows—the only decided rule being, that two corn crops should not succeed each other. Supposing the farm to consist of strong clay land, the rotation may be—potatoes, turnips or beans, drilled and manured, wheat, clover, wheat; or, fallow, wheat, potatoes or turnips, wheat or barley, clover, wheat. On loam, and the best kinds of light land, the Norfolk course should be pursued, viz. turnips or potatoes, barley, clover, wheat; or, a six-crop rotation occasionally, to vary the succession — turnips or potatoes, and such like manured green crops, wheat or barley, clover or grasses, oats, beans, barley or wheat. On light and poor lands, turnips, oats or barley, with grass seeds, pasture for sheep, during two years, oats, vetches, or peas.

If marl be applied every ten years, the rotation recommended for the best kind of light land may be advantageously followed for two or three years. By a proper succession of cleansing crops, the extravagance of fallowing will never be needful.

CROWSFOOT—An execrable weed, though, when bearing the well-known field-flower "butter-cup" it has a very imposing appearance: it can only be banished by a course of good tillage.

CULMIFEROUS PLANTS, are those which bear the stems or straw of corn from the root to the ear. Johnson gives no definition of his own, for the word culmiferous, but refers to explanatory quotations; among others, to the following, from Quincy, who says, that "*culmiferous* plants are such as have a smooth-jointed stalk, and usually hollow, and at each joint the stalk is wrapped about with single, narrow, long, sharp-pointed leaves, and their seeds are contained in chaffy husks."

Wheat, barley, oats, rye, maize, are culmiferous plants; these, when their leaves have withered, derive their entire nourishment from the soil, which they, consequently, exhaust, unless they be cut green for fodder; in which case they are similar in their effects to *leguminous* plants, (see *Leguminous Plants.*) Wheat, from the length of time during which it occupies the land, and the weight of its grain, is the most exhausting of this tribe of vegetables. The state of the soil after corn crops is very inferior to its condition after leguminous productions; for, in the latter case, the continued striking out of the roots tends to loosen and mellow it, and the overshadowing of the leaves, in summer, prevents the too rapid evaporation of rain or dew; while, in the former case, the plants having ceased to grow, long before they are severed, cease to push their roots through the soil, and afford no shade to retain moisture, from want of which the ground becomes hard and bound together.

DAIRY.—One of the great causes of the superior quality of Dutch butter, of which so much is sold in the London market, is the extreme degree of cleanliness observed through the course of management; some of the pastures on which the milch cows are fed, are, though luxuriant, extremely coarse in their herbage, and would therefore tend to render the proceeds of the dairy strong-flavoured, and in quality far inferior to that which might be expected from the fine and sweet pasture which the wilder parts of our own island afford; the cause of the difference, therefore, lies in the admirable system of cleanliness observable in Holland.

We shall commence our observations, where we ought, *at the beginning*, with the cows in the cow-house or byre. There they should be kept as free from dirtiness as possible, and, whether entirely or partially confined, have their beds and bodies kept perfectly clean, and their hind quarters, in particular, washed and curried when necessary. A leading preliminary point to be considered is, whether—circumstances permitting a free choice—it is more advantageous to keep dairy cows at pasture, or in stalls. Mr. Pooler, in his excellent "Irish Farmer's Manual" gives an extract from the details of Mr. Cramp, keeper of the House of Correction at Lewes, in Sussex, to the Board of Agriculture, which is well worth transcribing here, particularly when it is remembered that he obtained a prize from that board for his superior management of calves, (see *Calves,*) and stated, as an undoubted fact, that he had an actual profit of £331 6s. on the keeping a single cow, *in house*, during eight years, during which period she yielded 38,855 quarts. His practice was,

> "To feed his cow in summer upon *clover, rye-grass, lucerne, and carrots,* three or four times a day, giving at noon about four gallons of *grains*, and two of *bran*, mixed together, always observing to give her no more food than she eats up cleanly; in the winter season to feed her on *bran* and *grains*, mixed as before

stated; feeding her often, viz. five or six times a day; to supply her with food while milking; keeping the manger clean when she is fed with grains; never to tie her up, but permit her to lie in and out of her house as she pleases; and to be particularly careful to milk her regularly and cleanly, milch cows being often spoiled for want of patience at the time of milking them. This neglect frequently causes suppuration, and blindness in the teats—the want of milk."

He states that—"by feeding milch cows in this way, they will be always in good condition, and fit for the butcher, if an accident should happen. There will be no ground trampled, and food spoiled, by cattle running over a vast tract of land. I think cattle may be fattened by the same mode of feeding, with much advantage; one-fourth of the land would feed them, a great quantity of manure made, and the beast fattened much sooner. Cattle so fed have nothing to do but fill themselves and lie down to rest. *No labouring for their food.* I fattened the two cows I had before this, and made them very good meat in about seven weeks, (I found it to answer, although I bought the food at a dear rate,) giving them a little ground barley or oats mixed with the grains and bran. I think cows would nearly double (in the course of the season) their quantity of milk and butter by following the above plan.

"It is unnecessary for a cow to go dry long before she calves. The thing will tell for itself. When the milk changes brackish, she should then be dried off; that may be in three, four, or five weeks before she calves. Milch cows seldom go dry before, unless it is from neglect, poverty, sickness, or bad milking. Let the milk stand two days in summer, and three days in winter before it is skimmed, provided the milk is to be sold.

"I have stated no more than one penny per quart for skim-milk, but I am informed it sells in the town of Lewes, for three half-pence; it being worth one penny to put in the pig-trough. I fattened two pigs in the summer with no other food than skim-milk and grains, making them very good meat, weighing 9 or 10 stones each, at 14lbs. per stone. Where cows are kept in this way, pigs should be kept, as the milk will be (in the summer time) thick and sour, and fit for nothing else but pigs; the people of this country making no use of it as food.

"On trial, I found malt-dust to be serviceable to my cow, giving her about a double handful at a time, mixed with the grains and pollard. I would not recommend a greater quantity.

"There has been a doubt in the minds of some people, that I have over-rated my skim-milk at one penny per quart, according to the price of food in this part of the country where I reside. I am still in the same opinion, that skim-milk, at one penny per quart, is cheaper than any other food I can buy to feed my pigs.

"In managing milch cows after the manner I have described, difficulties may arise in the opinion of many people; but I think there are few difficulties but what might be remedied. If grains cannot be had, there is no land but will produce potatoes, and they are an excellent substitute for grains, pounded in a trough, or ground in a common apple-mill, and then mixed with bran. Bran also would be a good substitute for grains, wetting it to the same state as grains, and then mix a little ground oats or malt-dust to separate it. Milch cows may be fed with turnips and cabbages, provided proper attention be paid in doing it. One meal a day of turnips or cabbages will not affect the milk, provided care be taken not to give them any rotten or withered leaves; one rotten turnip or cabbage would do more injury to milk and butter than a cart-load of sweet, sound food. I have often given cabbage to my cow, without any ill effects whatever. I have sown rye and vetches, which I find to answer; they will come rather sooner than lucerne, if sown the first week in September. One gallon of rye is sufficient to mix with a bushel of vetches. If the rye be sown too thick, it will overpower the vetches, and injure them; but sown moderately thin, it will support them and keep them from the ground. I have sown oats and red clover, and cut the oats before they came out in ear; the oats will shoot up again, (if cut before they are in full ear,) and the clover grow up with them, and produce a good second crop; the clover will be in full perfection the spring following. After the crop of rye and vetches come off, lucerne may be sown, and it will be fit to cut once the same summer, but not later than the middle of October. The lucerne will be in full cultivation the next summer, and will produce four cuttings the season. Lucerne should be cut before it grows hard and sticky, or it admits waste, and loses much of its goodness.

"There is no land but will grow artificial grasses and vegetables; and, no doubt, it would answer even to cut the natural grass and feed them. The object is the great saving; for half the land would maintain them. The cattle produce, in general, nearly double the quantity of milk and butter, and a great quantity of manure made. Where cattle are kept in this manner, the dung should be gathered up every day, and thrown into a heap.

"The land to be cut should be that which lies nearest to the yard where the cattle are confined, in order to save carriage. Where milch cows are allowed to range abroad for their food, they will never produce that quantity of milk that they will when confined. Let their food be ever so plenty, when they are not hungry they will be searching after the sweetest spots of herbage, and thereby deprive themselves of rest. Cattle, when handfed, will seldom refuse any sort of food, if properly attended; and no part of this country need be at a loss for provisions to feed them. Where grains and pollard cannot be had, milch cows should have a little nice hay (not heated) once a day, to keep them in a proper state; otherwise, all green food would make them too loose. Often changing food is good for milch cows. I seldom give my cows two sorts of food following; I cannot be at a loss where there is so great a variety to be had, viz. *rye and vetches, lucerne, cinquefoil, trefoil, cow-grass, clovers, natural grass, green oats, carrots, cabbage, turnips, grains, bran, pollard, hay, &c. &c.*

"The management of a large dairy (after the plan which I have laid down) may be attended to in most of its rules. Grains seem to be the greatest obstacle; I will suppose they are not to be had at all; seven months in the year they are not wanted, as every kind of artificial food can be had in great plenty, giving a little sweet hay, once a day, to keep them in a regular state. In the winter time there may be provided turnips, cabbages, and potatoes; the two former will no ways affect the milk and butter, if given moderately twice a day, carefully avoiding giving them rotten and withered leaves; and giving them plenty of sweet (green-saved) hay, they will, no doubt, do much better than ranging abroad in the cold, hungry fields, labouring and fatiguing themselves for food, injuring the land, and thereby occasioning great loss of manure."

In the dairy districts in Scotland it is not unusual for the cow-keeper to let his cows by the year to his *daughters*—as a stimulus to their industry—at £10 per cow, payable by two instalments, viz. £5 on the 15th of May, and £5 on the 11th November. Whatever can be made over this sum by the girls is their own, (and well it may,) which they fund (or more truly *husband*) carefully, for a marriage portion. One or two cows are kept, under such circumstances, exclusively for the use of the family. In the neighbourhood of great towns, £12 per cow is often the ordinary charge in Scotland. The usual rate of hire paid in Ireland, for dairy cows, let to dairymen by the farmers, is £7 per cow; which, considering the superiority of Irish pasture, in many counties, plainly shows that in the great dairy districts of Scotland the cows are of superior milking qualities; they are either Ayrshire or short-horned. The dairy farmer wishes all his cows to calve towards the end of April, (which is effected by confining the bull in the byre until the middle of August,) that they may be on the top of their milk by the first of May, when (in the principal dairy districts of Scotland, invariably) they are let out to pasture on the new grass for the season. After the fourth night, in Scotland, they are allowed to remain out during the night, until the end of September. They are brought to the byre, to be milked, regularly at six o'clock in the morning and evening, after which they are immediately turned out to pasture, except when the weather is very hot in July and August; they are then kept in their houses for a few hours during the extreme heat of the day and *soiled*.

If dairy cows be kept entirely at pasture during the season, the extent of land necessary for their support will be at least three times that which would suffice if they were kept in house, with the liberty of taking air and exercise for only two or three hours in the course of twenty-four, which is desirable to relieve them from the tedium of confinement, and to promote health, on a bare pasture. There are farms, however—alluvial lands, for instance, which are overflowed in rainy seasons—on which a system of tillage is *impracticable*, and where cows, if kept at all, must be pastured at large; but, even in such case it would be more desirable to mow some of the grass, and to take it to the byre during the heat of the day, than to have it trodden under foot by a herd of heavy-hoofed animals galloping from place to place in unavailing efforts to escape from the torturing attacks of the gad-fly. There should always be a supply of succulent food for *house-feeding* in such weather, on *every farm*, and every cow-byre should be so constructed as to allow the cow-feeder a passage in front of each range of cows, (see *Cow-House*,) for the facility of depositing food in the mangers. In fine, we freely admit that a kind summer pasture will impart a superior flavour to milk and butter, and also that an individual cow will ordinarily yield more milk if at liberty, than if confined. Nay more, we allow, unhesitatingly, that cows fed on sweet natural herbage will yield milk and butter of finer flavour than if they were fed on *any artificial grasses whatever*, and that, though the quantity of milk will be greater on artificial food of a succulent quality, the butter will be less in quantity, and inferior in quality than if the cow were on *kind* and sufficient pasture. But, in estimating the quantity of dairy produce which a given farm (supposing it to be equally adapted to either purpose) would yield, under the two systems of pasture and house-feeding, the balance of produce and profit, from the great economy of land, and accumulation of manure, under that mode of management, would, under the former system, be considerably the greater. But we must hasten to the details of the dairy itself.

A dairy room should be cool in summer, and, therefore, provided with cross windows of small wire cloth for security against flies, (these may be removed for ventilation at night;) moderately warm in winter, so as to be, throughout the whole year, about 45 degrees in temperature. A northern exposure is the best, and if it can be so situated as to be shaded by trees or buildings from the sun, so much the better. The octagonal or circular shape is the most convenient; for supporting the coolers, flags should be built in the walls, four feet from the ground; these will be secure from vermin of any kind. A milk-house should have no inside communication with any other building; it should be kept clear from smoke, well ventilated, floored with marble or flag slabs, and perfectly clean, and nothing likely to give it a strong or bad smell should be kept in it.

All the utensils—the pails, hair-cloth sieves, (for passing the milk through, to free it from hairs and all impurities,) milk-dishes, or coolers, tubs, churns, (made of American oak,) and the butter-prints, should be kept perfectly sweet and clean, *scalded repeatedly*, (or, still better, actually boiled for two or three hours,) scrubbed, rinsed, and dried, every time they are used, otherwise they will have a bad smell, and spoil the butter. The most approved kinds of coolers are those made of cast iron, turned, and tinned inside, which are easily kept clean, with warm water, and a sponge or cloth; they are everlasting, and cheaper than wood, even at first cost. Every dairy vessel should be exposed to the sun for many hours daily. Sluts and daudles are unfit to be dairy-women, and no milker should be suffered to enter the dairy in a dirty apron covered with hairs from the cow-house, or with dirty hands. In many dairies cows are curried, combed, and brushed; and, before milking, their udders and teats should be washed clean. In some places cows are milked but twice a day, but in some of the best managed dairies, where they are abundantly fed, many of them will require to be milked at noon also. But it is said that milk so drawn will be inferior in quality, as twelve hours are required for the preparation of the milk in the cow; whatever be your times of milking, however, be sure to draw the milk completely off; the last drop is the richest, and, in order to have the best milk for family purposes, the milk-maid should, after the first milking, go round with a separate vessel, and milk into it the *strippings,* as they are called, until each udder is *perfectly dry.* The operation of milking should be performed very gently, otherwise it becomes a painful operation. Instances occur in which cows will not let down a drop of milk to a harsh, cross-grained milker, though they will let it flow in abundance when a mild, good-tempered dairy-maid approaches them. For the same reason, when cows are ticklish, they should be treated with the most soothing gentleness, and never with harshness or severity; and when the udder is hard and painful, it should be tenderly fomented with luke-warm water, and rubbed gently, by which expedient the cow will be brought into good temper, and will yield her milk without restraint. It sometimes happens that the teats of cows become hurt and sore, and the milk foul; whenever this is the case, such milk should not be mixed with any other, nor even carried into the dairy, and the teat, after it has been washed with soap and water, should be rubbed with Florence oil, or the ointment recommended in page 93 should be used. The milking should be commenced in summer at six o'clock in the morning, and at the same hour in the evening, and the milk should be removed quickly, with a frothing head, and passed into the coolers through a hair sieve.

Doctor Anderson gives these maxims with regard to the management of milk:—

"1st—Of the milk drawn from any cow at one time, that part which comes off at the first is always thinner, and of a poorer quality for making butter than that afterwards obtained, and this richness continues to increase progressively to the last drop that can be drawn from the udder.

"2nd—If milk be put into a dish, and allowed to stand till it throws up cream, the portion of cream rising first to the surface is richer in quality, and greater in quantity, than that which rises in a second equal proportion of time, and so on—the cream progressively declining in quality, and decreasing in quantity, so long as any rises to the surface.

"3rd—Thick milk always throws up a much smaller proportion of the cream which it contains, than milk that is thinner, but the cream is of a richer quality; and, if water be added to that thick milk, it will afford a considerably greater quantity of cream, and consequently more butter, than it would have done if allowed to remain pure; but its quality, at the same time, is greatly debased.

"4th—Milk which is put into a bucket, or other proper vessel, and carried to a considerable distance, so as to be greatly agitated, and in part cooled, before it is put into the milk-pans to settle for cream, never throws up so much, or so rich cream, as if the same milk had been put into the milk-pans directly after it was milked."

In Anderson's observations many good hints are given; among others, that the cows should be milked near the dairy, and that each cow's milk should be kept separate until the peculiar properties of each are so well known as to admit of their being classed and mixed together, which can be ascertained by a lactometer.

"This instrument consists of a glass tube, graduated or divided into *one hundred parts* or *degrees*; of these perhaps only twenty or thirty are marked from the *top downwards* and figured. This is filled with the cow's milk, and left to stand ten or twelve hours, when it will be very visible what *per centage* of cream the cow's milk gives, by observing the figure at which the milk and cream stand separated. For instance, if it stand at the twelfth degree, the milk yields twelve per cent; if at the fifteenth degree, fifteen per cent; and so on with the other figures."*

After giving the first half of the milk taken from the cows to the calves—supposing them to be reared in the proportion of one to each cow—or putting it into pails for the supply of new milk purchasers, *mixed with as much chalk and water* as an honest *dairy-man's conscience will lead him to apply;* the remainder should be placed in the coolers—the strippings apart from the other milk—and then treated in one or other of the two following methods, (for there are two modes of making butter,) viz. by churning the cream only, or by churning the milk and cream together. In the first case, the cream is allowed to stand on the milk in the coolers from twelve hours to five days—according to the state of the weather—for it will always keep better on the milk (until that becomes *bad*) than if accumulated with other cream; consequently it cannot be churned too soon after it has been floated off, or skimmed from the milk. The cream which first rises is thicker and better flavoured than that which rises subsequently, and is longer exposed to atmospheric influences. As the number of coolers required in the case of holding over cream must be a double set for each day, the expense and inconvenience occasioned by the system of churning cream only may be very considerable.

It is stated by Mr. Aston, in an essay "on the Dairy Husbandry of Holland,"† that

"When the cream is too cold, it is warmed by throwing some hot water into the churn, to bring the cream to about 70 or 75 degrees of temperature of Fahrenheit's scale."

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* Irish Farmer's Manual.

† Quarterly Journal of Agriculture, No. 21.

Mr. Pooler in his "Manual"—we suppose on good practical authority—thus expresses himself on this subject:

> "In regulating the proper degree of heat necessary to be maintained in the dairy, during the ripening of the milk, and in the cream in the subsequent operation of churning, science has now reduced that to a certainty which has hitherto been a matter of doubt.
>
> "'Butter of the *best quality* can be only produced at a *certain temperature*.' A knowledge of this fact is of the utmost importance to all engaged in dairy management, as by a proper application of this powerful agent, the business of the dairy may be performed with the same accuracy and certainty as that of the brew-house or distillery.
>
> "The degree of heat at which butter from cream can be obtained, ranges from 45 to 75 degrees, on the scale of Fahrenheit; but, to obtain butter of the best quality, it is necessary to be particularly nice in regulating the temperature of the cream just before churning.
>
> "To fix this amount of heat with the requisite degree of accuracy, the thermometer becomes necessary, as the human feelings afford no correct test for estimating it. By a long-continued series of experiments it is now proved, that butter of the *best quality* is obtained by churning the cream at 51 degrees, the agitation of the milk raising the temperature towards the close of the operation to 55 degrees; if the milk has properly ripened, this will be in two hours.
>
> "To obtain the *greatest quantity* of butter, the cream should be churned at 56 degrees; it will also, in this case, rise four degrees in the churning, and will take but an hour and a half to finish. Although this heat produces the greatest *quantity*, the *quality* is found inferior to the former.
>
> "The temperature at which butter can be obtained in the *greatest quantity*, and of the *best quality*, is a medium between the two foregoing estimates, viz. 53½ degrees in the cream before churning, and 57½ in the churn before the butter comes. At this heat every advantage is gained as to *quality*, and any additional *quantity* that may be obtained by higher heats, is only so much milk retained in the butter, which must greatly injure its quality. If the churning-house is properly constructed, it is easy to gain this heat through the whole season; for it has been found that when the heat of the air is at 75 degrees, during the day, it will be 50 degrees in a thatched milk-house at four o'clock in the morning; and, when the heat is below that, with the assistance of hot water you can bring the milk up to the heat wanted.
>
> "By taking higher heats, on purpose to accelerate the churning, the milk not being cleared out of the butter, it cannot keep, either fresh or salted."

When the cream is thick enough for being skimmed or floated off over the sides of the coolers, it should be placed in crocks or jars, of earthenware, but not in glazed ones, for the oxide of lead used in the glazing preparation, when combined with milk acid becomes noxious.

When the churning is over, the butter should be placed in pure, cold, spring water, with some *salt* in it, in order to purify the butter of every drop of milk, which would soon injure its flavour. The butter should then be salted with the finest salt, in the proportion of one pound to the stone, which should be perfectly blended with it. It is obviously an injurious practice to leave the butter of one churning unsalted, for the purpose of incorporating the produce of two or more churnings together; this mode injures the flavour of the whole quantity. By the way, a hint may be useful for giving a good colour and flavour to butter in the winter season. This can be imparted by grating the heart of the Alteringham carrot, and pressing the pulp into the last water in which the butter is washed. When the butter has been packed firmly in the firkin, allowing merely enough for the head of the cask, with a round-headed tramp-stick of sufficient weight and thickness, it should be covered with a little pure salt or pickle, and placed on a dry floor to prevent the effects of damp. There is little to be said of the other method, of churning milk and cream together.

The practice with regard to this point in the neighbourhood of Glasgow, where *superior* fresh butter is brought to market, is as follows:—Each meal is allowed to stand twelve hours in the coolers, and then it is put into an open barrel, in which it remains from thirty to forty hours, according to the state of the atmosphere. The dairymaid knows when it is fit for the churn by dipping the tip of her finger into the milk, which adheres to it like paste when it is ripe.

Each meal is churned by itself if there be a sufficient quantity; consequently, in large dairies there are two churnings every day. This is practised by Mr. M'Farlane, at Port Dundas, Glasgow, where he has 250 cows milked every day. By this latter mode there is a greater proportion of butter obtained by churning cream and milk together, than by the former management, and altogether we give it a decided preference. And in this case the buttermilk is more palatable for the use of man; under any circumstances, buttermilk is excellent for the pig-trough and the feeding of calves nearly reared. Where much skim-milk is required for the farmer's family, the first method is obviously preferable, at least to the extent of the supply required; one or two cows can be kept for domestic use. The clouted cream of Devonshire has long been considered a luxury. The process of divesting the milk of its component portion of cream, to an extent hitherto unattainable, has been effected by Mr. Carter, and is thus detailed by that gentleman in a paper presented to the Society of Arts:—

> "A peculiar process of extracting cream from milk, by which a superior richness is produced in the cream, has long been known and practised in Devonshire; this produce of the dairies of that county being well known to every one by the name of 'clotted' or 'clouted cream.' As there is no peculiarity in the milk from which this fluid is extracted, it has been frequently a matter of surprise that the process has not been adopted in other places of the kingdom. A four-sided vessel

is formed of zinc-plates, 12 inches long, 8 inches wide, and 6 inches deep, with a false bottom at one half the depth. The only communication with the lower compartment is by the lip, through which it may be filled or emptied. Having first placed at the bottom of the upper compartment a plate of perforated zinc, the area of which is equal to that of the false bottom, a gallon (or any given quantity) of milk is poured (immediately when drawn from the cow) into it, and must remain there at rest for twelve hours; an equal quantity of boiling water must then be poured into the lower compartment through the lip; it is then permitted to stand twelve hours more, (i. e. twenty-four hours altogether,) when the cream will be found perfect, and of such consistence that the whole may be lifted off with the finger and thumb. It is, however, more effectually removed by gently raising the plate of perforated zinc from the bottom by the ringed handles, by which means the whole of the cream is lifted off in a sheet, without remixing any part with the milk below. With this apparatus I have instituted a series of experiments, and as a mean of twelve successive ones, I obtained the following results:—4 gallons of milk, treated as above, produced, in 24 hours, 4½ pints of clotted cream, which, after churning only fifteen minutes, gave 40 ounces of butter; 4 gallons of milk treated in the common mode in earthenware pans, and standing 48 hours, produced 4 pints of cream, which, after churning 19 minutes, gave 36 ounces of butter. The increase in the quantity of cream, therefore, is 12½ per cent, and of butter upwards of 11 per cent. The experimental farmer will instantly perceive the advantages accruing from its adoption, and probably his attention to the subject may produce greater results. I shall feel richly rewarded if, by exciting an interest on the subject, I can produce any—the slightest improvement—in the quality or mode of producing an article which may properly be deemed one of the necessaries of life."

When whey is separated from the curd, (see *Cheese-making*,) it is readily sold in market, at a half-penny per quart. If not disposed of in this way, it is nearly brought to the boiling point, when it throws up a quantity of small curds, termed in Scotland *crop* or *flot* whey, which is immediately skimmed off, and when cold it is beaten up with *strippings* or *afterings*, and drank by the farmer's family. What is not used in this way is given to poultry, mixed with meal or potatoes, as a fattening food, and tending to render the flesh white and delicately flavoured. After the crop whey has been removed, a part of the thin whey is used for drink instead of water, and for making the family breakfast of porridge, and the supper of sowens, so delicious and wholesome to a Scotsman, who swears that disease of any kind is almost unknown where whey constitutes a principal portion of human sustenance. In some places it is given to horses, but more frequently to pigs, which thrive surprisingly on it.

Curds and whey used to be, and probably still are, sold during the summer, at a very early hour, in the streets of Cork, by women who present it in pails, at a cheap rate.

In warm weather, curds, with sugar, are a real delicacy at any table, and can always be prepared wherever *rennet* is at hand. *This* is prepared as follows:—Take the stomach of a calf; stuff it with dry salt; roll it up tightly with twine until it is wanted, then immerse a portion of it (according to the quantity of curd required) in pure whey or water. A wineglassful will coagulate several gallons.

DARNEL.—The bearded Darnel is frequent in some countries, but it is comparatively rare in this; it has been condemned as a poisonous plant for more than 2000 years.*

DRAINING.—Before the ordinary operations of ploughing and harrowing can proceed, lands are to be prepared for the regular routine of culture by draining.

"It is throwing away money to till and manure land while it is in a diseased state from dropsy, or other ailments which obstruct its powers of productiveness."

The immense tracts of our island which are now unproductive from excessive moisture, among other causes, and which might be most advantageously reclaimed, unhappily prove, that many of its proprietors are as destitute of enterprise and anxiety to improve the condition of their tenantry, as they are blind to their own interest, and unawakened to the advantages which would result from a proper application of capital.

No expenditure of money can be more remunerating to the proprietor of an estate than that which is laid out in the draining of it; and though the expense be frequently very heavy, it *must* be undertaken on every farm which requires it, before the occupier can expect a fair return.

In short, *draining* is, on many soils, the very first step to agricultural improvement, and it requires great skill and experience to perform it in the cheapest way, and with the greatest possible effect. In *ordinary* cases the operation of draining is easily executed; but in the more difficult and perplexing circumstances of springs and confined moisture, the aid of a scientific and practical person to give a proper direction to the drains, should be sought. It is often the best economy to employ a person of real skill in the science of draining. Half-a-guinea or even a guinea a day, is well bestowed on any intelligent and active person who understands his business, and knows how to employ a gang of labourers briskly, and to the best advantage. A man of professional judgment will sometimes effect as much benefit with one perch of drains, as a bungler will with half a dozen.

It is true that gentlemen farmers, (as they are called,) if *possessed of education and talents*, will learn the principles of draining through the medium of publications, such as those of Professor Low and Mr. George Stephens, (the latter a professional drainer and irrigator,) who clearly detail all the circumstances under which draining can be required, and prove their positions by plates and diagrams. But the great body of agriculturists, even of those on the most extended scale of farming, are either unwilling to study theories, or, if disposed to look at print, incapable of comprehending them. Men generally look to practice, and not to principles, and therefore frequently require in *draining*—the most difficult branch of agriculture—the aid of professional drainers, of whom, in Ireland, there are lamentably few.

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* Low's Elements.

Surface-draining is so simple in its nature, that any one may comprehend the principles and practice of it; yet it is often sadly neglected in Ireland during the winter season, when fallows should be well ridged up and furrowed. The only hint on this head necessary is, not to run the furrows up and down when the land slopes *much*; else the most fertile parts of the earth will be gradually washed downwards to the lower parts of the field, and accumulated there, or carried off into the dykes. In such case, the ridges and furrows should be run across the slope, but obliquely, at such angles as will admit of an easy and free escape for the water by the furrows, to the open drains or ditches at each side. In many parts of the clay counties in England, the old-fashioned form of a gently winding ridge and furrow is still preserved, to prevent a precipitate flow of the water. Mr. Stephens, in his excellent work on draining, observes—

> "I have often seen large tracts of clayey land intermixed with whitish stones, lying in subsoils, perfectly impervious, effectually drained by means of trench-ploughing, and keeping the furrows regularly deep from one end of the ridge to the other. If farmers occupying clayey soils would pay more attention to the formation of the ridges and furrows, and keeping the open ditches and cross furrows sufficiently deep to clear the surface of all the stagnant water in the hollow parts of the fields, there would be much less necessity for making drains for removing surface-water."

In the neighbourhood of Gistel, the treatment of wet and stiff land by Mr. Wieland is thus stated in the "Report of the Agriculture of Flanders," by the late Rev. Thomas Radcliffe:—

> "The farm on the western verge of Division No. 8, is of a strong quality of soil, and previous to its improvement was flat, retentive of water, given to rushes, and yielding crops of corn and pasture so very bad, that the occupying farmer was unable to hold it at six florins the *mesure*, about nine shillings by the English acre. Mr. Wieland took it into his own hands in 1807, and in about three years let it for fourteen florins the *mesure*, about twenty-one shillings by the English acre. The method he pursued consisted chiefly in dividing the fields by furrows of three feet wide, into distinct sets or compartments of sixty feet wide each, and dressing those from the side to the centre, or crown, in a raised and rounded form, so that

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the rain water should run off, and be conducted to the boundaries of the field, and from thence to a sufficient fall at the extreme enclosure of the farm. The elevation of the centre was about two feet above the level of the extreme sides of the sets respectively; and particular care was taken to lower the head-ridges, so as to remove all impediment to the running off of the water from all parts of the field. This operation, as well as that of dressing up the earth from the sides to the centre of the broad sets, was executed by means of a simple but useful implement,* which deserves particular attention."

All the cases of extreme wetness arise from one or other of these causes:—

1st—The obstruction of under-water in its course, (through strata of porous substances, such as sand and gravel, loose earths, and crevices of rocks,) by meeting stiff clay and other impenetrable matter.

2nd—The hardness of the under-soil, which allows no passage downwards to the rains which fall on the surface, and which, consequently, if the land be flat, load it with moisture, which has no proper vent, and cannot be discharged except by evaporation.

The first cause applies to many of our bogs abounding with quagmires. These are occasioned by under-water forced upwards, from meeting in its meanderings under ground, some impenetrable substance, such as a stratum of rock or clay, and by the pressure of the water from a more elevated source. This water, in course of time, in some degree dissolves the earth through which it forced its way, and gives it the loose shaking quality which every bog-trotter so perfectly understands. A few years ago, the upward discharge of a large body of water forcing its way through the clay partition which had confined it to a certain extent underneath, caused part of the bog of Allen to travel, in a half fluid state, considerably beyond its previous limits.

Anderson recommends the sinking of pits in the course of drains three or four feet deep, (where the depth of the bog precludes the practicability of cutting these drains to the depth of the under-soil,) and thus observes:—

"If you attempt to make your pit in one of those soft quaggy places where the water is found in great abundance, you will meet with very great difficulty in forming it; for, as the substance of which it is composed is soft, it will always flow into the hole as fast as you dig it, on which account I would advise, not to attempt to make the pit in the swaggle, (the shaking quagmire,) but as near it, in the solid earth, as you conveniently can. However, if it is pretty firm, and of no great extent, it is sometimes practicable to make a pit in the soft bog at the driest time of the year. This I have sometimes practised, which gave me an opportunity of observing the nature of these bogs more perfectly than I otherwise would have had. In the trials of this kind that I have made, this soft quaggy ground has seldom been above three or four feet deep, below which I have always found a stratum of hard tough clay, usually mixed with stones, and so firm that nothing but a mattock or pick-axe could penetrate it; and, as this is comparatively so much drier than the ground above it, an inexperienced operator is very apt to imagine that this is the bottom that he is in search of. In digging through this stratum, you will frequently meet with small springs oozing out in all directions; some of them that might fill the tube of a small quill, and others so small as to be scarcely perceptible; but, without regarding these, you must continue to dig on without intermission till you come to the main body of the reservoir, if I may so call it, that is contained in the rock, gravel, or sand, which you will generally find from two to four feet below the bottom of the swaggle, and which you will be in no danger of mistaking when you come to it; for, if there has been no opening made before that in the field, as soon as you break the crust immediately above the gravel or rock, the water bursts forth like a torrent, and on some occasions rises like a *jet d'eau*, to a considerable height above the bottom of the ditch, and continues to flow off with great impetuosity for some time, till the pent-up water, being drained off, the violent boiling up begins to subside, and the strength of the current to abate, and in a short time it flows gently out, like any ordinary spring; allowing it to remain in this state, the quaggy earth begins to subside, and gradually becomes firmer every day; so that, in the space of a few months, those bogs which were formerly so soft as hardly to support the weight of a small dog, become so firm that oxen and horses may tread upon it without any danger of sinking, at the very wettest season of the year. I have had a field of this nature, that, by having only one such pit as I have now described opened in it, was entirely drained to the distance of above one hundred yards around it, in every direction. But, as it is possible that the stratum in which the water runs may be in some places interrupted, it will be in general expedient to make several of these pits, if the field is of great extent, always carrying the drain forward through the lowermost part of the field, or as near the quag as you conveniently can, and sinking a pit wherever you may judge it most necessary. But if the stratum of gravel is not interrupted, there will be no violent burst of water at opening any of these after the first, as I have frequently experienced. To keep these wells from closing up, it is always expedient to fill them up with small stones immediately after they are made, which ought to rise to the height of the bottom of the drain.

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* The Mouldebaert.

"I have often imagined that the expense of digging these pits might be saved by boring a hole through this solid stratum of clay with a large wimble made on purpose; but, as I never experienced this, I cannot say whether or not it would answer the desired end exactly.

"If the whole field that is to be drained consists of one extensive bog, it will require a long time before the whole work can be entirely finished, as it will be impossible to open a drain through it till one part of it is first drained and becomes solid ground.

"In a situation of this kind, the undertaker, after having opened a drain to convey the water from the lowest part of the bog, must approach as near to the swampy ground as he can, and there make his first pit, which will drain off the water from the nearest parts of the bog. When this has continued open for some time, and that part of the bog is become so solid as to admit of being worked, let

> him continue the ditch as far forward through it as the situation it is in will admit of, and there sink another pit, and proceed gradually forward in the same manner, making cross-cuts where necessary, till the whole be finished."

It does not appear that Mr. Anderson, who *suggested* the use of a boring implement, had actually tried the auger which Elkington subsequently employed to such effect. There are many variations in the circumstances which occasion bogs, and the *science* of a drainer will be often required in the application of the remedy; one object, however, in all cases, should be to reach the bed in which the water is contained, by drains, wells, or auger-holes. Wetness arising from what is called a spring, stopped in its progress, and by the pressure of fluid from a higher level, forced to the surface, without forming quagmires and bogs, is, in many places, easily cut off by making a drain opened *a little above* the place where it appears, between wet and dry, as the well-known expression is; the artery is to be cut through by the field-surgeon, and the stream conducted by an artificial drain.

In this case, cut deep and through the loose substance, if practicable, else the water trickling downwards, will break out in some other place. If the drain be cut too high above the place where the water appears, it will require an unnecessarily deep drain to catch the water, and if too much below it, the water may pass over the drain altogether, after all the trouble bestowed on opening and filling it.

Mr. Elkington mentions, that in tapping a spring on one side of a steep hill, the opposite side became dry. The instantaneous relief given to wet hills in some cases, by opening a vein, is interesting; the water sometimes rises to a great height, and forms a spout for a considerable space of time. But this can only occur where the water tapped flows from much higher land; the *pressure* of the water above causing the spring to rise in this way. Sometimes different springs will issue from one vein or porous stratum, and skill will enable the drainer to dry up the swamps by a single cut.

> "And in practice," as Professor Low observes, "it is well to wait to mark the effects of a drain cut in the higher part of the slope to be drained, for these effects often extend further than might be anticipated, removing springs, bursts, or oozings at a greater distance."

We shall give another extract from the professor's book:—

> "At the upper part, where the wet tract to be drained appears, or between the wet and dry, let a few pits be dug, the place of each pit to be marked out nearly in the direction of the proposed line of drain, six feet long by three in width, in which space one man, and, if required, two, can work; let the earth be thrown out to the lower side, and to such a distance from the edge of the pit as not to press upon and break the sides. Let these pits be cast out to the depth of five or six feet, or more if necessary, so that we may reach, if possible, the porous bed in

which the water is contained. Should we find no water, then let us apply a boring-rod in order to ascertain at what depth the porous substance lies, in which the water is contained. Sometimes water will not be found until we come to a great depth; it may be so deep that we cannot reach it by any drain, or even by boring with the auger. In this case we are saved the labour of making the drain unnecessarily deep. Sometimes we shall proceed to a considerable depth without finding any appearance of water, when, all at once, by breaking through some thin stratum, we shall reach it. The water is frequently seen, in this case, to boil up like a fountain, and this affords the assurance that we shall succeed in our object. This species of preparatory examination by means of pits, is therefore, in many cases, useful. It affords the means of judging of the proper depth and dimensions of which the drain shall be formed; it prevents the committing of errors in the laying out of the lines of drains, and it enables the drainer to enter into contract with his workmen with precision."

In the very unfavourable case of a swamp at the bottom of a field in the form of a *bowl-dish*, if the drainer can find an outlet for the confined water by cutting a channel through any part of the circumference of the surrounding land, to lower grounds, the disease is, of course, at once removed; but in many cases the swamp lies below the level of any adjacent water-course, and consequently too low for the discharge of the water by cutting drains around. Under such disadvantageous circumstances, the only possible remedy seems to be that of sinking wells (one or more according to the size of the marsh) until a porous stratum be reached. It rarely happens that a vein of gravel is not found within a moderate depth of such a diseased spot, and frequently very near the stiff crust of argillaceous clay on which the water rests; when that loose stratum is opened, the stagnant water rapidly disappears.

But this labour should not be undertaken without first ascertaining, by a boring auger, the depth at which a stratum of gravel or sand lies. There need be no loss of time, or guess-work, in the case; the auger will *probe* the exact depth, and the farmer can take his proceedings accordingly. If the surrounding surface-water be prevented by a rim of clay from flowing in at the top of the well, there will be no danger (the case from its very nature presupposes that the *subsoil* is impervious to wet) of water soaking in through the sides; and if any oozing from above works downwards, it can be bailed out with a dish or bucket. As soon as the porous earth is fully reached, the well should be filled to the mouth with small stones or screened gravel, through which the surface-water gradually finds its vent.

Such a piece of work as this evidently requires the superintendence of a skilful person, for, if injudiciously undertaken, the *loss* might be much greater than the *gain*. A knowledge of the *principles* of draining, in such a case, is essential, for, although the circumstances should be critically what they are supposed to be in this instance, after cutting down through the tenacious clay, a flood of water *might* rush *upwards*, and inundate the surrounding marsh to a much greater height than could be imagined possible. Any person who has a just notion of hydraulics can easily understand how this might occur. If there were a neighbouring lake or other body of water on a *higher* level, and that one of its subterraneous discharging channels happened to be tapped at the bottom of the well, though formed for a very opposite purpose, this unwelcome gush would take place.

Wetness arising from the second cause—surface-water lodging on retentive under-soils—should be removed by parallel drains* within twenty feet of each other, through the hollow part as much as possible, no matter how zigzag these may be; for it is obvious that water will lodge in these unless carried off by channels.

If a main channel is to be covered over, (fig. 8, page 153,) less than twenty inches in width will not be sufficient to allow room for laying the side-stones in a firm and permanent manner, and as a general rule for the construction of deep main drains, it may be stated, that after the depth of five feet the width at top should be increased four inches for every foot in depth. In forming the drains, a sufficient (but not an abrupt) fall at the bottom should be given in order to allow the free passage of the water to the outlets, which should be from six to twelve inches square, according as they open from main or cross drains. Where stones are scarce, and lay fields are to be drained of surface moisture, *sod drains* answer extremely well if properly executed. The directions are simple, and are thus briefly stated by Mr. Stephens:—

> "The method of making shoulder drains is by digging a trench from fourteen to sixteen inches wide, the sides perpendicular to the depth of two or three feet, and then by taking out the last spit by the spade, the breadth of which is three inches at the bottom, and four or five at the upper part. A shoulder is left on each side, on which the sod that was taken up first is carefully laid with the grass side downwards, or if it is not strong enough, others must be cut in the vicinity, and the remaining space filled with the loose earth, a few inches above the level of the surface of the adjacent earth."

Where a tough sod is at hand, no description of drains is so unexpensive, and if properly made it will last many years. These are, however, often made without a shoulder for the sod to rest upon, which is, in such cases, placed with the grassy side underneath, at an angle on the bottom of the drain, so as to form an hollow triangular passage underneath. But the wedge-drain, fig. 2, is preferable to this, and stones or tiles, if they can be made without much increased expense, incomparably more durable, and therefore cheaper in the *end.* Where the land to be drained is a dead level, surrounding open drains must be cut, (as in the case of flat bog,) to which the covered drains are to lead, and into which they are to empty themselves; however irregular the direction may be, these drains should be opened through the hollows, if such there be, else water will lodge in them. Where tiles forming an arch at top are cheap, they make very perfect conductors for the water, which, however closely they may be connected, will always leave a sufficient opening for the water to trickle into from above. These cross drains should be of the dimensions stated in the case of the sod drains, sufficiently deep to be untouched by the plough, if they be filled with small stones, to the height of fourteen or sixteen inches. Bogs, especially when *shallow*, (the draining of deep and extensive bogs can only be undertaken by great capitalists,) and free from quagmires, may be easily rendered dry, and suitable to many of the purposes of husbandry. If the peat be very shallow, its admixture (after perfect draining) with the under-soil forms a sufficiently solid and fruitful earth, peculiarly suited to meadow grasses; but in draining *deep* bogs care should be taken to withdraw the water gradually, and, consequently, not to make the drains, in the first instance, too deep. Peat sinks considerably by the abstraction of its fluids, and becomes a mere mass of dry, fibrous matter, like the refuse of charred wood. Every one who has examined the high and much-drained parts of a bog in summer, must have perceived the utter worthlessness of the over-drained substance. By *degrees* the drains are to be sunk in bogs of much depth, according as the peat sinks and consolidates.

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* For details, see page 152.

Shallow bogs, in which the wetness usually proceeds (though in a greater degree) from the same causes which affect clay soils—the hardness of the bottom—are to be drained somewhat in the same way, but left in *flat* ridges or sets, from the obvious reason that the water subsides so rapidly from the loose peat into the furrows and drains that are opened, that the ridges do not require a rounded form. In draining these shallow bogs, if there be no natural or previously formed main drain, one should be cut in the lowest part of the swamp, and several small ones cut at the best points of inclination through the peat, until they reach the clay bottom, along which the water is conducted to the main drain. If the land have no slope, auger-holes through the clay at the bottom of the drains will convey the water downwards into the loose strata, usually found within a few feet of the hard soil. Where the auger is not at hand, pits answer equally well. But as Mr. Johnstone observes, in his "Address to the Board of Agriculture," before any *extensive* draining is attempted in this manner (by pits or auger-holes,) "It should be ascertained whether the porous strata immediately under the clay is *dry*, and will receive the water when let down into it from above, or being already saturated with water itself, may, in place of receiving more, throw up a greater quantity to the surface, and thus, instead of remedying the evil, render it worse. This may sometimes be the case, and the substrata may contain water that makes no appearance on the surface *at this place*, owing to the superincumbent body of clay, but which being connected with some higher spring may flow up when a vent is given to it by the auger.

"Thus would a greater quantity of water be brought to the surface, which, having no outlet through the circumjacent bank, would render the ground much more wet, and might even, in some situations, almost form a lake."

What would ninety-nine out of every hundred of our land proprietors say to a speculation of draining—suppose a tract of marsh seven feet below the level of the surrounding land? They would first pronounce that it would be impossible to drain land so placed, unless subterraneous outlets should be found on application of the auger—a merely possible supposition—and then they would plead the tremendous expense of any effort to carry off the water under such desperate circumstances, and decide on leaving the tract (of perhaps fine alluvial soil) to the undisturbed possession of wild-ducks and snipe. Yet a piece of land under the discouraging circumstances which we have just supposed (and consisting of two or three thousand acres) *has been drained* and rendered worth seventeen shillings per acre, in *Flanders*, by the energy and skill of a single proprietor. The work was executed as follows:—

A dyke fifteen feet wide and ten feet deep, which conducts the water to a navigable canal, was cut all round this moor; the excavated clay was formed (on the interior side) into a bank eight feet high. Windmills were then erected to throw the water from the marsh into the dyke, and the whole of the marsh was then intersected by drains from eight to twelve feet in breadth, with a fall towards the mills.

These mills with full wind can discharge forty gallons per minute; and the land thus reclaimed has been rendered highly productive.

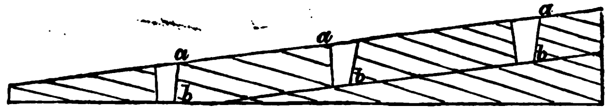
The extent of land injured by springs from beneath is very inconsiderable compared with what is diseased by the retention of rain-water on the surface, in consequence of the close disposition of the subsoil, which renders it impervious to the pernicious moisture. The depth of drains for cutting off these springs and conducting the water to the outlets, must depend on the depth of the springs, and the direction of those drains (as relates to the inclination of the ground) must be regulated by the line of communication between the springs, and other local circumstances.

But it is in the draining of those soils which have a retentive surface, that difficulty and expense are most seriously encountered, and yet without effectual draining the application of manures is very unprofitable. Supposing a field with a non-absorbent subsoil to have a considerable slope, the first point to be settled is the direction in which the drains are to be cut. The generality of practical writers on the subject agree in theory with Mr. Stephens, that "when the ground has the least declivity, the drains should always be directed obliquely across the slope, or as directly across it as the nature of the surface and outlet will allow;" and that "drains winding across the slope or declivity of a field, whatever their number or depth may be, will have a much greater effect upon tenacious or impervious substrata than if they were made up and down the slope; and when the soil is mixed with thin strata of fine sand, which is the case nine times out of ten, the effect will be increased in proportion, and accordingly a much less number will answer the purpose, the expense will be greatly lessened, and the land and occupier much more benefitted in every respect."

Mr. Smith, already referred to, however, has maintained, in a pamphlet on thorough-draining, a contrary opinion, one which we had deemed untenable and exploded. This gentleman, who within fourteen years has executed 100 miles in length of drains on his own clayey farm, lays it down as demonstrable, that the drains should be cut in the direction of the declivity. This experienced person's opinion is entitled to great respect; and his principle is now acted on in Roxburghshire and other parts of Scotland; and we are disposed fully to agree with it from careful observation within the last year of the relative effects of longitudinal and oblique draining on a close subsoil. There is a continual flow in the former, while the others convey the merest trickling of water. In the latter case the moisture gradually sinks beneath the bottom of the drain, but through the longitudinal channels it runs freely off altogether.

"It has been pretty generally believed and argued, that drains laid off in this manner on a steep will not be so effectual in catching water, but this notion can be shown to be erroneous. Drains drawn across a steep, cut the strata or layers of subsoil transversely; and as the stratification generally lies in sheets at an angle to the surface, it will be seen, on reference to the plate, that the water passing in or between the strata, immediately below the bottom of one drain, nearly comes to the surface before reaching the lower drain, as at *a a a*; but as water seeks the lowest level in all directions, if the strata be cut longitudinally by a drain directed down the steeps, the bottom of which cuts each stratum to the same distance from the surface, as represented by *b b b*, the water will flow into the drain at the intersecting point of each sheet or layer, on a level with the bottom of the drain, leaving one uniform depth of dry soil. This applies alike to water flowing from below or falling on the surface; the truth of this has been practically proved on a large scale in soils of various natures, where spouty banks have been completely dried without a single cross-drain. It does sometimes happen that there exists what is called an 'eye-spring,' arising from some accidental tubular opening in the substratum. In such case it may be necessary to run a small branch drain from the nearest parallel drain into the eye of the spring. This, however, is of rare occurrence.

"A very important advantage of having the drains down the steep, is the prevention of any lodgment of mud or sand, the current having force from the declivity to carry them along to the main drain, besides, in the event of any accident choking a drain, the water will either, by its altitudinal pressure, force through the obstruction, or by bursting out at the surface, will show very nearly the spot where the evil exists. Whereas cross-drains, having little declivity, are often filled high up with water for years before the insidious cause of mischief is discovered."



If there be a fallacy in the proof (we by no means assert that there is) it propably results from the assumption of the geological law of "the stratification *generally* in sheets at angles to the surface." We do not clearly see how this bears upon the case of water resting on the *upper* portion of the impervious substratum, which *generally* runs *parallel* to the porous surface-soil, that is, in the direction *b b b*. There can be no doubt, however, of the necessity of such a degree of obliquity as will give a free and immediate fall to the water as it filters from the surface to the bottom of the drain.

Mr. Smith's directions for making the drains are thus given:—

"The lines of drains having been marked off in the field, the drainer begins by cutting with a spade on a line, then removing a first spading of about 13 or 14 inches wide all along; another follows with a narrower and tapering spade made for the purpose, taking out another spading, and, when picking becomes necessary, a third man follows with a pick, and a fourth with a large scoop-shovel, to cast out the earth; a smaller scoop-shovel is used to clean out the bottom, which should be cut as narrow as will allow the last drainer a footing, generally about 3 or 4 inches. From 2 to 2½ feet from the surface, are the best depths for such drains; the latter always to be preferred. The bottom should be cut as straight and uniform as possible, so that the water may flow freely along at all places, and it is better to cut a little deeper, where there is any sudden rise of the surface, than to follow it and where sudden hollows occur, the cutting may, on the same principle, be less deep; attention to this also admits of after-straightening or levelling of the surface, without any injury to the drains. The workmen in cutting should throw the earth to the right and left from each alternate drain, as that allows the plough to go regularly and be constantly occupied in filling in the earth, whilst each alternate ridge or space is left for getting in the stones, free from the earth thrown out. The stones may either be laid down at intervals by the sides of the drains, to be there broken, or being broken in masses at some convenient spot, and at such convenient seasons as best suit for the employment of spare labour, can be brought by the carts ready to be filled in. No stones should be filled in till the whole line of drain has been cut out and *inspected*, but the sooner drains are completed after having been cut the better, and they should always be filled from the higher level downwards. Sometimes, when there is much tendency of the sides to fall in, it becomes necessary to fill in going along. Cutting in the summer, when there is little water in the soil, or in any dry season, saves much of this. In soft or sandy bottoms, by cutting the drains to half the depth in the first instance, and allowing them to remain so until the water has been voided from the upper stratum, the lower part may then be cut out with more safety from falling in."

Fig. 1.

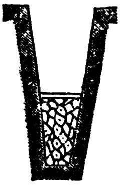


Fig. 2.

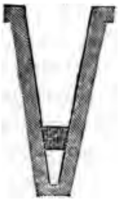


Fig. 3.

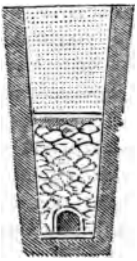


Fig. 4.

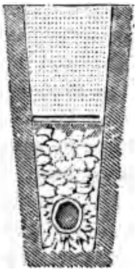


Fig. 5.

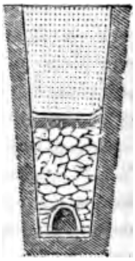


Fig. 6.

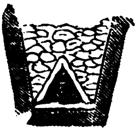


Fig. 7.

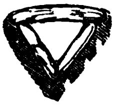


Fig. 8.

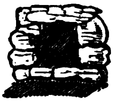


Fig. 9.

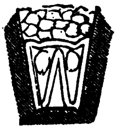


Fig. 1 represents one of these drains with the stones and covering sod.

The round gravel (free from any admixture of sand or earth) or broken stones should not exceed the size of a hen's egg, and these, as the same practical agriculturist observes, should be covered with a thin, tough sod (the grassy side downwards). No other kind of covering will lie so close, and therefore with so little danger of being disturbed by the subsoil or trench-plough. It may be of advantage to tramp or beat down closely the first two inches of soil put over the turf, in order to assist the formation of a permanent crust.

It is distressing to witness the general indisposition of the Irish landlords, as a body, to aid their tenantry, as is done in England and

Scotland, in the essential work of drainage on the flat, clay soils which, in consequence of neglect in this particular, are of little value to either party, though there are local facilities inviting the application of capital and labour, for so essential and so remunerating an operation.

Mr. Smith, who well knows that his subsoil plough can be of little comparative use without a "*complete and uniform* dryness" of the soil, before it is applied, has furnished tables of the expenses on the Scotch and statute acres, where stones are used for filling, and where tiles are employed.

In his calculations, the cutting of the drains is estimated at from 1s. 6d. to 2s. 6d. per rod of thirty-six yards, according to the hardness of the subsoil; the stones from 1s. to 1s. 6. per rod, and the breaking from 9d. to 1s. per rod. In some cases of very close draining, the expense amounts to £12 per Scotch acre.

The cost in Ireland would not any where exceed two-thirds of this.

If small stones cannot be easily obtained, tiles are very much used, and when manufactured on the spot, especially with machinery, as introduced by the Marquis of Tweedale and other land-owners, the cost is not serious;* the saving of wages in collecting, carting, perhaps breaking, and filling in stones, nearly counterbalances the cost of tiles. There is also some saving in the cutting of the drains, as those for tiles may be six inches shallower than when intended for stones. The description and the price of tiles varies with the nature of the soil; *sole* tiles are unnecessary where the bottom is hard, and these are sold at half the price of the covering tiles, which, in the case now supposed, are alone necessary. Figs. 3, 4, 5, page 153, show the different kinds of tile drains.

Thin, flat stones often abound in argillaceous soils; these are frequently placed in as in fig. 6, and kept in their position by the perpendicular and lateral pressure of other small stones; but they sometimes fall in and obstruct the course of the water. The same objection may be urged against their being laid, in what Mr. Smith terms, an inverted couple, (fig. 7,) which, however, he thinks preferable to the other. We have sometimes seen one row of flat stones, placed like the rafters of a shed, against one side of the drain, and with the angle behind and the space above, filled with small stones. The drain, (fig. 9,) is also objectionable, as the top and sides may collapse.

Some place two or three slaty stones on edge, side by side, leaving openings for the water to pass through, and laying flat stones above. This is the very worst possible kind of drain. Indeed none of these contrivances are half so good as the filling with small stones, which can never close, and therefore secure an uninterruptedly free channel for the water to filter through. In other drains, the water is liable to be impeded, if not altogether arrested in its course, by vermin or accidents.

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* A moveable steam apparatus has been contrived for the rapid manufacture of tiles. This can be taken from one farm to another, and hired for the job.

DRAUGHT.—The powers of horses and other beasts of draught have been, especially in Ireland, applied within a few years with much more effect than formerly. The same description of horse which, twenty years ago, pulled 6 cwt. or 7 cwt. with difficulty, can now draw 15 cwt. without any violent exertion. The great improvement which has taken place in the level and formation of roads has mainly contributed to this advancement in the application of animal labour, and to a pretty general knowledge among carters of the plainer principles of traction.

Much difference of opinion prevails, however, among scientific men upon mechanical points affecting the principles of draught, especially where four-wheeled carriages for a high velocity are concerned. In England great prejudice prevails, in favour of waggons of ponderous size, requiring teams of four, five, six, and eight horses. In Scotland, where economy is more consulted, and in Ireland, where want of capital prevents a vast majority of farmers from employing any description of cart, which is not cheap, simple, and fit for *every turn of work*, the one-horse, light, two-wheeled cart is almost universally used. The reasons severally urged by the advocates of the four and two-wheeled vehicle are as follows.

The favourers of the waggons of various kinds, so much in use in the southern parts of England, maintain that the horses, by working in team steadily together, though they may draw lesser loads in this combined way, last longer than if working singly under two-wheeled carts, which often press intolerably upon their backs, and shake them extremely on uneven roads.

"They insist also that those in the carts are, from their unvarying efforts, sooner tired, and the wear is consequently greater than in waggons, in which they can occasionally relieve each other; that the whole load being above the axle-tree in the carts, it throws so much weight upon the horse, in descending hilly roads, as to endanger his safety, while it equally impedes his exertions in the ascent; and that, while the one horse is compelled to use his utmost strength to overcome any sudden obstacle, the power of a team is, in a similar case, only applied to one-half of the load, which, in the waggon, rests equally on both pair of wheels: thus supposing a ton to be loaded upon a cart, and that a short rut in the road is to be surmounted, the whole, being upon one axle, must be dragged out at once; but were the same weight upon a waggon, it being divided upon the two axles, is drawn out at two separate pulls, the first of which clears the fore-wheels before the hinder fall in."

The advocates for carts contend—

> “That there are but few articles, except long timber, which may not be conveyed on a carriage with two wheels equally as well as upon one with four; that single-horse carts are easier loaded and unloaded, handier for almost every purpose, and that six or eight may be driven by one man, with the assistance of a boy; that they are also less destructive to the roads than waggons, especially in hilly roads, where the wheels of the latter require to be locked; that they carry more in proportion than either waggons or carts drawn by two or more horses, and are consequently more economical.”*

On heavy roads full of ruts, on very long journeys, and with full loads, waggons are probably most advantageous, but in ordinary cases, and especially where quick movements are required, as in general farm work, besides being expensive, and a load in themselves, they occasion a great waste of draught power. *The nearer that the horse is to his load the better*, consequently the English mode so frequently practised, of yoking from three to five horses to a plough or waggon, in a line, one after another, is the worst possible. In proportion to the distance at which animals of draught are removed from their load, is the loss of power. It is hard then to understand upon what principles—they certainly are not mechanical—this extravagant waste of labour is systematically permitted. We are safe in asserting that three horses, (supposing these in both cases to be of similar strength and form,) with Scotch carts, which are partly drawn and partly borne on the back, would pull as heavy a load as five horses would, attached in line, to a four-wheeled waggon. The loss of one in four has been ascertained at the collieries in Durham, when the horses were probably yoked in the more favourable manner of our mail-coach horses. The experiment is thus stated—

“ A two-horse cart carried - -	36 bushels, weighing	29½ cwt.
A three-horse ditto - - - -	48 - -	39
A four-horse waggon - - - -	74 - -	60

Whereas, now, a one-horse cart carries 24 bushels, weighing 19½ cwt., and travels 26 miles in twelve hours.”†

The same principle applies in some degree to the case of two horses harnessed tandem to a Scotch cart; here is some loss of power, the two horses *abreast* would do more, and with perfect equality of labour, which does not hold in the other case, for in descending a hill the whole weight rests upon the back of the shaft-horse, while the other is totally relaxed, or if the driver, through stupidity or drunkenness, allows the leader to pull, the tendency of his draught is to lift himself off his limbs, and to drag the other on his knees; when ascending a hill the leader often draws too much, while the shaft-horse declines from his pull, and on a level, if the leader be lower than the wheel-horse, his traces, instead of being in line with those of the shaft-horse, form a considerable angle, and tend to bear the load downwards on his back; if the cart be without a regular load the driver becomes utterly careless, and perhaps allows a spirited and willing leader to draw the wheel horse, the cart and the driver—who falls asleep after his dose of whiskey—as long as his energies permit.

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* British Husbandry, page 160.

† Ibid.

> "Hence, although the fore-horse frequently throws the whole labour of draught upon the horse behind, yet, by exerting his force solely in pulling, without bearing any portion of the weight, and by the starts and jerks to which he is subject, he is almost always found to be more distressed on a journey, or by any continued work, than the horse on which the burden falls more constantly and equally."*

Where three horses are used, they should be yoked abreast, if the breadth of the road will permit. In ascending a hill, it is evident that the power of draught will be increased by drawing from the locality of the axle, and not from the forepart of the shafts; but on a smooth level road requiring no effort to lift the wheels over any obstruction, (to overcome such, with any wheel-carriage, the inclination of the traces downwards, from the collar to the axle, will facilitate the effort,) horizontal draught is the best. The *average description* of road must of course regulate this point. To compare small things with great—a cripple whose weight is seven stone, long in the habit of travelling about in a four-wheel cart, drawn by four dogs, has subsequently substituted a two-wheeled light framed cart with horizontal shafts, 4½ feet in length, and on this, drawn by only one dog of the same set as before, he now travels between Dublin and Wexford, a distance of eighty miles, with less fatigue to the dog than when he was one of the team of four.

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* Low's Elements, page 133.

The French two-wheeled carts are extremely long and narrow, probably from being much used in the carriage of timber; these are undoubtedly more easily drawn than those which are short and broad.

In either cart or plough, horses should have their necks perfectly free; the system of tight bearing reins, even for coach horses, especially on ascending ground, is very questionable, and never pursued in France or Germany. In the former country, the horses are at full liberty to stretch out their necks as they please, and this freedom, in mounting a hill, or on a level, if the pull is considerable, greatly aids their efforts, by rendering their *weight* most available in traction. When they are thrown on their haunches by being reined up, their power of draught is more confined to their muscular action, and their weight of body does not *tell.*

The Germans in harnessing coach-horses fall into the opposite extreme from ourselves, for they tie down to the pole the heads of their wheel-horses, to make the utmost of their weight at a dead pull. The free action of the head and neck in heavy draught is very important; in slow and heavy farm work there is no occasion for bearing up the horses.

In *coach* work especially, when the draught is light, there are strong reasons for keeping up the neck in an unnatural position, viz. to allow the driver greater power in rapidly directing the horses' movements, and to assist those of *infirm limbs* in keeping their feet.

The best composition for greasing wheels is that recommended by a celebrated French chemist, viz. eighty parts of grease, and twenty parts of black lead, (plumbago,) reduced to *very fine powder*, and most intimately and completely blended together. This is used at the French mint for locks, &c. and is surprisingly durable. A very small quantity suffices.*

DRILL CULTURE.—Every *reading* farmer knows that Jethro Tull, an Englishman who lived in the early part of the last century, was the father of drill husbandry. Like every enthusiast, however, he carried his theory too far, for his notion was, that wheat—the most scourging corn crop—could be perpetually produced from the same field, if sown in drills sufficiently apart, to allow constant horse-hoeing between them, and with alternate intervals of fallow ground, between the rows of drill wheat, for the succeeding year. He took an erroneous view of the food of plants, thinking that they derived their nourishment from the particles of earth, in a state of solution, absorbed by their roots, without any reference to manures. His error lay in not making sufficient distinction between the different ingredients in soils; he applied *generally* what was only partially true; he imagined that the whole art of husbandry consisted in perfectly *pulverizing* the land; but all modern farmers well know that a rotation of crops is necessary, that land will *tire* of producing the same crops, and that the excretory matter of wheat, or any other crops, repeatedly deposited in the soil, becomes eventually hostile to the continued reproduction of the same crops, though it must be admitted that the application of lime, or burning the soil (but this latter remedy is sometimes pernicious) will decompose those excretions to a great extent. The Scotch adopted his system of drilling and horse-hoeing turnips, in 1760, though his own countrymen very slowly pursued it.

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* See Quarterly Journal of Agriculture, No. 42.

The following resolutions, which were proposed by Sir John Sinclair at an agricultural meeting in Holkham, on the 6th of July, 1819, comprehend every thing necessary to be said on the subject of drill culture.

THE CULTURE OF LEGUMINOUS OR GREEN CROPS.

"1. Culture in rows is the system best calculated for every species of the leguminous or green crops, unless in very dry soils and climates, where the crops, if cultivated in raised ridges, would be apt to suffer from the want of moisture. That by drilling green crops, more surface is exposed to atmospheric influence; and additional opportunity is given for the vegetation and destruction of weeds; and any extra moisture in wet soils is carried off.

"2. Drilling is peculiarly calculated for the culture of beans, not only in loamy soils, but even in strong and rich clays; that when drilled, from the manner in which the plants grow, the pods are placed on the stem from the root upwards, and of course must derive essential benefit when filling, by the admission of air through the open space left between the drills.

"3. The drill system is likewise to be preferred for turnips, more especially when sown early in the season. By that system, recent and moist manure is directly applied to the seed; the labour of hoeing is greatly simplified, and carried on with more expedition; the number of plants to be left on a given space can be much more regularly and correctly adjusted; and the circulation of the air among the plants is greatly promoted.

"4. In cultivating potatoes by the plough, the row-culture ought to be preferred, provided that care be taken to have a sufficient distance between each row, namely, from twenty-five to at least thirty inches, so that the fibres, which nourish the plants, may not be disturbed by the hoeing, which would render the stems puny, and bulbs few and small.

5. Though the culture of carrots *broadcast* answers well in deep soils, yet by drilling on raised ridges this useful plant may be cultivated with profit on soils where it would otherwise be hardly practicable; the drills furnishing an artificial depth of soil, in which this root can be raised. The proper depth between the rows, to be fourteen to eighteen inches.

"6. In the culture of the beet, or mangel wurzel, the drill system is to be preferred, at a distance of about twenty-seven inches between the rows.

"7. Peas, more especially with a mixture of beans, are best cultivated in rows, at from twenty to twenty-seven inches apart, provided that any weeds which grew among the peas are pulled up by the hand, and the intervals repeatedly hoed. Under this system, a crop of drilled peas has been found as clean as the beds of a garden, and the produce abundant, while the headlands sown broadcast, produced a miserable crop of grain, thinly scattered among a multitude of weeds.

"8. Tares ought likewise to be cultivated in drills, more especially if sown in spring; and if repeatedly hoed, will, in dry seasons, be a more profitable crop than beans."

"9. Every species of the kale or cabbage tribe should be cultivated in rows.

THE CULTURE OF CULMIFEROUS OR GRAIN CROPS.

"1. The drilling of culmiferous, or grain crops, when it is conducted with skill and attention, is a practice in general highly to be approved of, as the seed is thus deposited in the soil with great exactness in respect of depth, regularity, and proportion, and is so placed that the crop can afterwards be improved in its progress towards maturity. In moderately rich soils, there may also be a saving of seed sufficient to defray any extra expense attending the drill system; but the extent of that saving must depend upon the fertility of the soil.

"2. In light soils, drilling has the important advantage of giving the grain a *good hold* of the ground, and of giving all the seed the same hold, which prevents the frost from throwing out the plants in spring, or the wind from loosening the roots after the stem gets high, or when the ear is filling.

"3. The progress of the plants after the land has been stirred in spring, is in the highest degree surprising, even in wet districts, but that in dry climates, the process must be still more beneficial.

"4. The expense of cutting down a drilled crop in harvest, is uniformly less than one which is sown broadcast, for three reapers will do as much work in the former case as four in the latter.

"5. With a view merely to the extirpation of weeds, drilling autumn or winter-sown wheat is not essential, as the ground may be previously cleansed by a summer fallowing, where that practice is adopted; but that it is highly important to be enabled in spring to pulverise the ground between the rows of drilling wheat, for the reception of clover-seeds; and that with drilled grain, the succeeding crop of clover must always be superior, both from the freer admission of air, and as the corn is less apt to be lodged or beat down in wet seasons.

"6. In strong, wet soils, and in moist seasons, sowing broadcast may often be necessary, and that drilling will not answer so well, unless the ridges are carefully ploughed in autumn, or early in winter, to *the exact breadth which suits either one or two movements of the drill machine;* and unless in spring, the land is merely scarified or harrowed, (the winter's frost having rendered it sufficiently friable), and the corn is drilled by a machine drawn by a horse walking in the furrows.

"7. Crops, when drilled, are some days later in ripening, and that in very gravelly or stony soils, or in undulated districts, where the land is steep, or when a crop is taken after ley, or where the land is not in the best state of tilth, drilling cannot be executed with the regularity and exactness that is required to insure the success of that operation.

"8. In highly cultivated soils, either thoroughly cleansed, or where the crops are so luxuriant as to overpower all annual weeds, sowing broadcast possesses advantages over drilling, the seed being scattered more evenly over the land, and the roots not being so matted together as when drilled. In very rich soils, also, the hoeing is apt to throw the vigour of the soil into the stems or foliage instead of the fruit. Hence, though the straw may be strong and abundant, the grain is apt to be defective in quality, and diminished in quantity.

"9. In very rich soils, crops sown broadcast, and covering the whole surface, are more likely to be abundant, than when only a part of the soil is productive.

"10. On all lands where annual weeds are abundant, white crops, sown in spring, may be drilled with advantage, for the purpose of cleansing the land more effectually, and at a cheaper rate than hand-hoeing, and hand-weeding broadcast crops. The lands of moderate or inferior quality will thus yield a greater produce, and may be brought more nearly on a footing with fertile lands than under the broadcast system; hence the drilling of crops in such soils cannot be too strongly recommended as a most important national object."

Mr. Taylor, a very eminent English farmer, is of opinion that the exceptions admitted by Sir John Sinclair in the seventh paragraph (as regards grain crops) are not of any weight. He observes, that he has seen drilling "applied to corn crops on various soils, from the sharp gravels of Norfolk to the rocky districts of Lancashire, and firmly believes that the exceptions to its general rule are much more rare than is supposed." With regard to the eighth paragraph, he remarks, that "in drilling too wide, or, what comes to the same thing, sowing too thin, such a result might take place, but not otherwise;" he adds that "experience seems to have decided upon between eight or nine inches as the best distance for wheat, and from six to eight for barley and oats, according to the quality of land." The main object being to keep the land clean, there ought to be room for hoeing between the drills, else the corn might as well be sown broadcast.

The good effect of stirring ground about young trees is well known to all planters; it is equally powerful in its effect on the plants we have been considering, in causing the roots—the organs of nourishment—to shoot out with great avidity for food, and to tiller wonderfully. The heads and stalks of corn sown in drills and hoed properly, are much larger and stronger than those of grain sown in the other way.

Barley requires drill culture less than any other grain; as it is sown so late in the spring, the ground has not time to become hard, nor the weeds time to mature their growth.

In a word, drill husbandry is the most perfect mode of culture, and we hope to see it widely extended in Ireland.

Though Tull, its originator, was ridiculed at first even for drilling potatoes, turnips, and cabbages, his system is now universally pursued with regard to those crops, and there is no doubt of its being equally beneficial in respect to corn crops.

DUNG.—See *Manures*.

EARTHS.—Various substances, chiefly mineral, are combined together to form soil. These substances of themselves have neither taste nor smell, and cannot be dissolved in water. On the proportions in which they are blended depends the quality of the compound soil. Formerly there were only four or five enumerated. Lime, alumine, argil or clay, silex, and magnesia; but others have been added, though they bear extremely small proportions to these. "Soils or earths are termed siliceous, aluminous, calcareous, magnesian, and ferruginous, according as silica, alumina, lime, magnesia, and oxide of iron prevail." Under the head of lime is comprehended all calcareous matter, such as limestone, marble, marl, chalk, and gypsum. Alumen, argil, or clay, which is never found free from some combination of iron, and sometimes a little magnesia, has even in its purest state from fifty to sixty per cent of fine sand; this has many varieties of colour, and though requiring long exposure to the atmosphere and much working, is highly productive of many crops. When this forms the subsoil it is impervious to wet; and it very generally is at the bottom of bogs even on the highest land.

Silex is that substance which appears in the various forms of sand, quartz, and vitrifiable earths.

Magnesia, the last of the principal ingredients of soils, is found always in combination with other substances, but particularly in rock-salt and salt-water; when it prevails in lime, it is by some considered, we believe erroneously, to have a noxious influence.

Soda and potass, which are alkalies, are among the component parts of soil. Muriate of soda is, in fact, common salt, the beneficial effects of which, in promoting vegetation, when not in excess, are so well known. There are other constituent substances also, (vegetable, animal, and mineral,) which, bearing a very inconsiderable proportion in the composition of soils, are not worth enumeration.

There are *inflammable* earths too, such as peat, which are or may be combined with the others. On the proportions in which the principal substances are blended together, obviously depends the quality of the compound. (See *Loam.*)

"To attempt to class soils with scientific accuracy would be a vain labour; the distinctions adopted by farmers are sufficient for the purposes of agriculture, particularly if some degree of precision be adopted in the application of terms. The term sandy, for instance, should never be applied to any soil that does not contain at least seven-eighths of sand; sandy soils that effervesce with acids should be distinguished by the name of calcareous sandy soil to distinguish them from those that are siliceous. The term clayey soil should not be applied to any land which contains less than one-sixth of impalpable earthy matter, not considerably effervescing with acids. The word loam should be limited to soils containing at least one-third of impalpable earthy matter, copiously effervescing with acids. A soil to be considered as peaty, ought to contain at least one-half of vegetable matter."*

The able chemist just referred to has given an analysis of some soils, of which the results are interesting. For example:—

"A good turnip soil in Norfolk, containing eight parts in nine of siliceous sand, gave,

Carbonate of Lime - - -	63 parts per cent.
Silica - - - - -	15
Alumina - - - -	11
Oxide of Iron - - - -	3
Vegetable and saline matter - -	5
Moisture - - - -	3
	100

"On soil in Sussex (six parts sand, and one of clay and firmly divided matter) producing flourishing oats,

Silica - - - - -	54 parts per cent.
Alumina - - - -	28
Carbonate of Lime - - -	3
Oxide of Iron - - - -	5
Decomposing vegetable matter - -	4
Moisture and loss - - -	6
	100

"An excellent wheat soil in Middlesex gave,

Carbonate of Lime - - -	28 parts per cent.
Silica - - - - -	32
Alumina - - - -	29
Animal or vegetable matter and moisture -	11
	100

"Of these soils the last was by far the most, and the first the least, coherent in texture. In all cases the constituent parts of the soil, which give tenacity and coherence are the finely divided matters; and they possess the power of giving those qualities in the highest degree when they contain much alumina. A small quantity of finely divided matter is sufficient to fit a soil for the production of turnips and barley; and I have seen a tolerable crop of turnips on a soil containing eleven parts out of twelve sand. A much greater proportion of sand, however, always produces absolute sterility. * * * Pure alumina or silica, pure carbonate of lime, or carbonate of magnesia, are incapable of supporting healthy vegetation.

"No soil is fertile that contains as much as nineteen out of twenty parts of any of the constituents that have been mentioned."

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* Sir H. Davy's Elements of Agricultural Chemistry.

Professor Low states the circumstances under which soils are most fertile.

"1. Soils in which the largest quantity of silica and alumina exists in the state of impalpable division, are, *ceteris paribus*, the most fertile.

"2. Soils in which the sand is fine and only partially siliceous are comparatively fertile.

3. Oxide of iron exists in all soils, but does not influence their fertility in proportion to its larger or smaller quantity.

"4. * * * * * * * *

"5. Carbonate of lime exists in the best soils, and generally, though not always, in larger quantity in the better than in the inferior soils."

ELM is next to the ash in value for the farmer's purposes, and the best timber that can be laid with thorn-quicks for hedges. The plants when put out in hedges with thorn-quicks should not exceed twelve inches in height. The common sorts, or wych elm, are the best for agricultural uses. The elm has a decided advantage over the ash, in not robbing its neighbours of their fair proportion of food, and impoverishing the soil.

EMBANKING—On this subject the reader is referred to Mr. John Johnstone's Treatise on Draining Land, and on Sea, River, and Lake Embankments, third edition. In this the best mode of protecting land from the encroachments of the sea, and from inundations of lakes and rivers, and of the formation of dams and weirs, is ably and practically treated.

"The observations on reclaiming land from the sea by embankment are deserving of the serious consideration of those proprietors whose estates lie contiguous to the sea coast. Much valuable land has already been acquired in this way, and that much more may yet be gained at an expense having a large remunerating advantage, is an incontrovertible fact. It is principally a want of attention to the subject, and a deficiency of the necessary information, that prevents many landholders from perceiving its importance, and feeling that interest in it which it certainly merits. Of the achievements of Dutch enterprise and perseverance in this respect few persons are ignorant; and to revert to these is sufficient to prove the practicability and advantage of effecting much more than has yet been done in Britain by such undertakings. On the embanking of rivers to protect the adjoining lands from the regular and constant action of the current, and also from the ravages of inundations, Mr. Johnstone's remarks will likewise be found highly valuable. Though this is a branch of the subject less difficult than the former, mistakes are very often committed in its execution; and much expense might in many instances be saved, by an acquaintance with the principles on which the work should be done. These consist in a careful attention to the nature of the soil; the proper form of the banks, or that which is best adapted to resist the force and action of the stream; and to the materials of which, according to circumstances, it should be composed, and which will serve as its defence."*

ENCLOSURES.—" An enclosure may generally be defined, with reference to agriculture, to be a space of ground surrounded by a fence." An unenclosed farm is very unpicturesque in summer, and in winter wild and cheerless; yet in countries such as France and Germany, where cattle are not turned out at large, and where every perch is profitable for vines or corn, the land saved for those productions, by the absence of fences, is very important in an economical point of view, both as regards the saved portion of land itself, and the headlands, (which are never productive of corn,) and the economy on the point of labour required for keeping fences in repair. In some parts of England, too, there are large tracts of unenclosed land, though mere patches compared with the extent in Picardy, and in parts of the German territories; and, though the traveller's eye is displeased by the *uncomfortable* aspect presented to its view, there is every indication of very thrifty management.

It is impossible to fix any general rules on the subject of enclosures, for the size, direction, and number of these must depend on the limits of the farm, the nature of the soil and climate, and the system of husbandry to be pursued.

On an arable farm, besides the necessary enclosures about the homestead, viz. garden, orchard, paddocks for calves, rams, &c. &c. there should be a number of fields, proportioned to the rotation system contemplated. Where a four-crop course is to be practised, there should be four, eight, or twelve enclosures, according to the extent of the farm, and the quality of the soil, which must regulate the size of the fields; for instance, on a wet, flat, clay soil, it would be very injudicious to have large fields, else the intersecting under-drains might not have free vent to the open dykes at the sides and bottom; in such cases, the fields should obviously be smaller than on loamy or calcareous soils, and of a narrow breadth, to facilitate the discharge of water.

Generally speaking, square fields are the most convenient; if, however, (as is the case on the high raised ridges of Gloucestershire and Cambridgeshire,) the ploughing is always in the same direction, an oblong rectangle is the best shape, having the shortest headlands and fewest turnings for the plough.

"The *shape* of enclosures is chiefly regulated by the nature of the soil. It is demonstrable that the shape which contributes most to economy in the labour of a moderate-sized field, is the square. Frequent turnings of the plough consume much time; but on the other hand, an inordinate length of ridge to obtain few turnings, fatigues the horses beyond their strength. The strength of a horse is, in this case, the measure of the greatest length of ridge to secure the greatest economy of labour in ploughing the field. Horses can draw a plough through cultivated ground for 250 yards at one breathing; so that a field of 250 yards square is the shape which contributes to the greatest economy of labour in every kind of ploughing. The square might be profitably employed on clay lands, upon which the size of farms, and of course their enclosures, are comparatively small, on account of the large quantity of working-stock which are required to be maintained for judicious management. But a space of 250 yards square only contains about 13 acres imperial, which is too small an enclosure for land on which live-stock are reared. As 250 yards is the length of ridge most easy for the draught of horses in the plough, enclosures on loams should, therefore, be of the shape of a parallelogram, to contain the requisite number of acres; and as the direction of the ridge should be north and south, the longer side of the parallelogram should, of course, be east and west. The corners of enclosures should be right-angled, because the plough can turn over more of the earth in four square corners of a field than in two obtuse and two acute-angled corners.

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* Quarterly Journal of Agriculture, No. 30.

"Farms on clay lands are never large, seldom exceeding 200 acres. On a farm of that size, seven enclosures would contain less than 30 acres each. These 30 acres, comprised in an enclosure of 580 yards in length, and 250 yards in breadth, would constitute a very proportionably-shaped field, the plough being easily drawn along the 250 yards comprehending its breadth by horses on level ground at one breathing. This clay-land farm might be divided into 14 enclosures of 15 acres each; but 15 acres is a small enclosure for a large farm, and so minute a subdivision of land, which is not destined for the support of live-stock, appears an unnecessary waste of ground by fences."*

The want of enclosures in France has been attributed to the subdivision of land consequent on the extinction of the law of primogeniture. It is remarkable that an opposite result is produced in Ireland (where other matters, too, go by the rule of con-tra-ry) from the same cause,—the minute subdivision of property. In proportion as the property in farms becomes subdivided, the number of enclosures is increased. This is remarkably exemplied in many parts of the baronies of Forth and Bargie, in the county of Wexford, where, on holdings of five and ten acres, the enclosures are as numerous as on farms of one hundred acres.

On pasture farms especially, well-sheltered enclosures are obviously necessary, as cattle can neither rest nor thrive if exposed to a hot sun, or a chilling wind; corn-fields also, in exposed situations, require shelter from high winds, and, while well-timbered enclosures impart the aspect of luxuriant beauty, they at the same time give the reality of usefulness and comfort.

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* Quarterly Journal of Agriculture, No. 25.

FALLOWING.—In proportion to the progress of green crop culture will be the relinquishment of the system of *summer* fallowing, which, *after a farm has been once got into proper order*, and with a regular rotation of ameliorating and cleansing crops, alternating with grain crops, is quite unnecessary. Unless on the first occupation of an exhausted and dirty farm, and without the means of manuring for fallow crops, the system of an entire summer fallowing is indefensible. Even on the strongest clay land, good, deep, and very early autumnal ploughing, with the subsequent spring culture *well executed*, and manure, ought to be sufficient for the production of crops. If the soil be of too tenacious a quality for turnips, it will yield potatoes, beans, or cabbages, and the horse-hoeing process will render it friable and fit for the ensuing crop of wheat.

With the general mass of Irish farmers, what is called a summer's fallowing, is a very different operation from that pursued in England, on the clay lands, on which a team of four or five very powerful horses is employed to give repeated ploughings and harrowings, without affording time for weeds to grow, after which, good farm-yard manure is ploughed into the ground preparatory to the wheat-sowing.

In Scotland there is no deficiency on this point; but in Ireland the process too frequently consists (with the poorer farmers) in giving two or three *scratchings* with a pair of worn-out horses, if the land be moderately loose, or with four miserable animals, of which the leaders are probably year-and-half olds; and these scratchings are so "few and far between" as to allow full time for a goodly crop of weeds to spring up, and perhaps mature their growth. After this very imperfect tillage, and the loss of a year's crop, it is no very uncommon thing to take a scourging crop of wheat (*by way of renovating the land*) without any manure, the summer's rest to the land being considered sufficient to render it fertile and fresh again, and unexampled to apply dung of any kind preparatory to the wheat crop. Lime is the ordinary stimulant in the case of Irish fallows, even on calcareous soils, as in the counties of Carlow and Kilkenny. Good farmers are of opinion that it is better to apply putrescent manures to such fallow crops as potatoes, &c. to be succeeded by wheat, than to have wheat in the first instance; if lime cannot be procured without extreme expense and inconvenience, and that the peculiar circumstances of the farm render an entire summer's fallowing necessary, it is undoubtedly better to apply putrescent manure at the end of summer, when the land is in the best state for cart-traffic and working, preparatory to a crop of wheat, *to be succeeded by clover*, than to sow that important grain in an unmanured fallow, which, in such case, can only yield half a crop, with the prospective labour of tilling again and manuring in the ensuing year.

But whatever be the difference of practice as to the application of manure for wheat, it is certain that the objects of fallowing, which are, the renewal of the exhausted powers of vegetation, complete pulverization of the particles of earth, and the cleansing of the land from weeds, are not to be attained by two or three light and hasty ploughings. Much discussion has taken place as to the influences which tend to renew the exhausted powers of land which has undergone a complete fallowing. Some *theorists,* who perhaps have not had the advantage of practice, lay much stress upon the power of *light* and *heat* on soil fully exposed to the solar influence. We are inclined to coincide in opinion with Mr. Main of Chelsea, in his observations "on a new theory of fallowing," that the shading of the ground from the action of the sun is the object to be sought, because the effect of the sun's *heat* (or *light*, for in *this* case they must mean the same thing) is to evaporate the rich juices, which artificial manures, or natural decomposing vegetable matter in the soil may have incorporated with it.

> "Why (asks Mr. Main) is it that one good thick-standing crop is always followed by another? Why is lea-wheat better if the clover has been mowed twice than if it had been depastured? Why is land found to be in better heart after a heavy green crop than it is after bearing a white crop?
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> "The answer to all these questions is the same, viz.: the soil has been completely shaded from the summer sun.
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> "If a heap of stones be suffered to lie on a fallow-field throughout the summer, and be not removed till seed time, the spot will not only be visible by a much stronger growth of corn in the first, but for several years afterwards. Add to this what was said by an agricultural philosopher, that 'if he could cover his fallow fields for the whole summer with boards, his next crop would be doubled.'"

The real benefit of fallowing lies in loosening the adhesive particles of soil, and in the admission of air—so essential to vegetation—in suppressing for a season the productive powers and energies of the earth—and in destroying the vitality of weeds and dissolving them altogether, by exposure to the withering influences of the sun and atmosphere; all which effects may be produced by green-crop culture. On friable soil there is no sufficient excuse for periodical fallowing, whatever may be urged in excuse for the practice on strong chalky or clayey land. The number of ploughings and harrowings must be regulated by the nature and condition of the soil. Four good ploughings (exclusively of the first in the preceding autumn) and as many harrowings, ought to be sufficient even on the most stubborn soils. If a *fallow crop*, suppose turnips, is to be put into the ground, three summer ploughings ought to suffice, as the crop must be sown, at the farthest, in July. Any thing deserving the name of fallow could not effectually be done in time for sowing Swedish turnips, for if the land be in such a dirty state as to require the process at all, the extirpation or dissolution of weeds, and pulverization of the land, could not be accomplished before the month of May, when those turnips ought to be sown.

In all cases of fallow, the first ploughing should be given immediately after harvest, and as deep as the quality of the soil will permit, with four strong horses or oxen, if the land be very stiff and retentive of water, and in all cases the field should be well ridged and deeply furrowed.

Immediately after the stirring time of spring-work is over, if fallow crops are to be sown, the second ploughing is to take place, and in the same direction with the former one, lest by cross-ploughing, a fall of rain should stagnate on the surface; but in light soils a cross-ploughing is preferable, even at this early time. The third ploughing should be executed in June, and at this time, always across the original direction of the ridges; harrowing with a heavy break—if the land requires it—should regularly succeed the summer ploughing, (with rolling, if necessary,) and the harrowing is to be executed by repeated double turns, crossing those of the previous ones, until the land is sufficiently pulverized to admit of the easy collection of weeds, with the harrow, the couch-rake, or prongs.

"It is of great importance at this period of the summer-fallow, to drag to the surface, and collect as large a portion as possible of the roots of vivacious weeds in the ground; for this being the period of active vegetation, every part of these roots which is left in the ground will grow again and extend itself. It is by the repeated action of the harrows that these roots are detached from the soil and dragged to the surface. When necessary, the roller is also to be employed. This, bruising the clods or indurated masses of earth upon the surface, enables the teeth of the harrow to act upon them. When the roller passes over the ground, the harrows immediately follow.

"At this time, too, the grubber may be employed, as subsidiary to the action of the harrow.

"This is a period of the summer-fallow at which all obstructions arising from land-fast stones and other impediments to tillage are to be removed, and if drains are required, the stones collected upon the surface being led forward at once to the drains, and filled into them in the manner to be afterwards explained."

Mr. Low then proceeds with directions for a diagonal ploughing, (in order that the previous ploughings should in some degree cross each other,) with harrowing, rolling, and weeding again, which is the fifth ploughing with him, and yet not the concluding one, for he supposes a sixth for ploughing in well-fermented dung, previously to the seeds sowing in September.

When lime so peculiarly suited to wheat is substituted for dung, as is universally the case in Ireland, it is laid on, in a state of powder, either directly from the cart, and evenly scattered with a shovel, as in Great Britain generally, or first deposited on the surface in heaps, (as is the Irish custom,) and then scattered about. The latter mode is a defective one, for, in this case the entire portion of the heaps is not always slaked when the spreading takes place, and the spots on which the heaps have rested, have more than a proportionable share of the lime.

Fallowing, whether it be winter or summer, for a long or a short period, is the basis of all field husbandry, and should be perfectly executed. In England and Scotland it commences immediately on removing the corn crops from the field; in Ireland, we regret to say, it is frequently postponed until after Christmas, in order to allow cattle to browze upon the natural grasses and weeds which are so abundant on fields badly managed. On the 10th of March, in the present year, many stubble fields (designed for oats) remained unturned; the operation had been procrastinated until the frost and snow had rendered field labour on wet soils impracticable, from January to that period. Such miserable husbandry is rare, however, with the more thrifty and intelligent classes of farmers.

FARM.—In selecting a farm, a prudent man will take care not to encumber himself with a greater extent of land than his capital will allow him to manage in a husbandry-like manner. A farm insufficiently stocked and manured, will produce less than a smaller one economically treated, while in the latter case there is the saving of rent, taxes, and labour. Many a man has been ruined by a large farm, who might have acquired a competency with one of half its size! The proportion of capital required is variously estimated, and must entirely depend on the *circumstances* of the farm. The amount may be said to vary from £4 to £10, for every acre.

In Ireland, where the tenant has to provide buildings, and execute all preliminary improvements, such as draining and enclosing, on entering into occupation, the capital required on his part is greater than that ordinarily needed in England, where the landlord erects and repairs buildings and enclosures, and where farms, *from attention to covenants*, are usually in fair condition for the incoming tenant (see *Covenants*); yet, with this advantage, £10 per acre has been calculated as the necessary capital on a farm of 250 acres in Staffordshire. The return on this capital ought to be from ten to fifteen per cent. above the maintenance of the farmer's family. The proportion which rent ought to bear to the actual produce of the land, is somewhat vague. The Bible informs us that, in the early ages of Egyptian husbandry, the fifth part was paid to the king—as rent of course,—" And it shall come to pass in the increase, that ye shall give the fifth part unto

Pharaoh, and four parts shall be your own for seed of the field, and for your food, and for them of your household, and for food for your little ones."—Gen. ch. 47, v. 24. When a money rent was first substituted in England for that in kind, a *third* of the average value of the produce, under the common system of husbandry, (when a calculation could be made in a rough way with sufficient accuracy,) seems to have been the rate of payment, and this is now the most general standard. But where *superior skill*, and the application of extraordinary capital enables a tenant to make an extraordinary profit, the landlord has no right to an additional demand. This must in fact be determined by the value generally laid upon the same description of soil in the neighbourhood. The rent is in reality the surplus which remains, after the maintenance of the tenant, the payment of labour, seed, and taxes, the interest of his outlay, and a reasonable allowance for skill and assiduity. This surplus, *averages* probably one-third of the produce. The *quality* of the soil, and the aspect of the farm will be paramount considerations in the selection of a farm; the facilities of market and manure will also have great weight. Land nominally cheap is often very dear, from the inferiority of its quality, its previous exhaustion, want of drains, fences, buildings, &c. Prime land is often the cheapest, even at a comparatively high rent.

FARMER.—Some people think that they may undertake farming with little or no previous knowledge of the innumerable branches of agriculture. A Mr. John Wright gave the public a few hints on this point more than twenty years ago. In the late Irish Farmer's Journal he says—

> "The truth appears to be, that instead of the occupation of a farmer being soon and easily learned, and any thing making a farmer, that the whole life of man is too short to make a complete farmer and grazier; and that there never was any man that understood every part of it in full perfection. To justify this assertion let us look at some of the requisites.
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> "He certainly ought to be a complete judge of horses, neat cattle, sheep, and swine. He ought to know farriery well, for the generality of farriers are very ignorant, and many a good horse is lost through ignorance only; as to the disorders of neat cattle, sheep, and swine, they are still less understood. He ought to know enough of bringing animals into the world to be able to assist all parturient animals in bringing forth their young, and to be able to judge between all natural and unnatural presentations, and to be able to reduce the latter to the former. He ought to undertand the surveying of land; and if taken to a piece of land he never saw before, should know whether it is best adapted for grazing or arable: if the former, in what manner it should be stocked; if the latter, for what crop it is best suited, and what will be the best rotation for it. He should know chemistry, in order to ascertain what soils may be benefitted by mixing with each other, and in what proportion, in order to form a perfect soil. He ought to be a mechanic;

many of his implements are now becoming very complex, such as the two-furrowed plough, which requires great attention and ingenuity to set it well; the different drills, winnowing and threshing machines, all require the continual inspection of a good mechanic; he should also understand the practical part of his whole profession, such as ploughing, harrowing, rolling, sowing, weeding, hoeing, reaping, mowing, stacking, thatching, hedging, ditching, planting, rearing and plashing quicks, shearing sheep, and dressing them for the scab, fly, halt, or for mutton; should know the art of hollow-draining wet soils, and irrigating dry ones. He ought also to know all the different grains, pulse, and seeds well, from the small Dutch clover to the potato, in order that he may not sell under their value, nor be imposed upon when he buys his seed; the best time for sowing and cutting them, either for fodder or seed; should also understand the making and preparing compost dung-hills. He ought also to be a bit of a carpenter, gardener, and orchardist, and to understand the forming of new roads, and repairing old ones; and the weaning, rearing, and fattening all animals. He ought to be a judge of wool, and the animal that wears it, from the Merino, South-Down, and Rye-land, to the heavy, coarse-woolled Lincolnshire; and in neat cattle from the small Welsh and Highland stot to the large Durham, and a hundred other things too tedious to enumerate. I expect to be answered, that a farmer keeps people to do all these things, therefore it is not necessary for him to know them. But I assure them it is; suppose, for instance, he goes into the field, and finds his men ploughing badly (though it is doubtful if he would find it out unless he knew the practical part; but admitting him to be a judge) he might find fault; but if neither master nor man knew how to remedy it, he might as well save his breath.

"And to add to all this, a farmer's business is never learned, he must act and go with the times and seasons, and can never reduce it to a certainty. A mechanic, after he has made an article, can at a certainty make a thousand more like it; not so the farmer, he can do nothing without God; he shall prepare his soil, and sow his seed, and reap an abundant crop. In the year following he prepares the same soil in all respects in the same manner, and is totally disappointed. He shall buy the best seed-wheat to be procured, mildew ensues, and his produce is chiefly bran.

"These are a *few* of the things a farmer and a grazier ought to be conversant with; and if he has no wife, or what is still worse, a *bad* one, his domestic concerns within doors will be as numerous as those without."

Seriously, though it is not necessary that the head of a large farm establishment—often a gentleman in every sense—should be well acquainted with the practical and mechanical details enumerated so humorously by Mr. Wright, he should be bred to his business, have an intelligent mind, promptitude of action, a sharp eye to every thing in his line, a general acquaintance with the principles and practice of his art, and such a knowledge of accounts as will enable him to keep accurate statements, not only of the general expenditure and receipts of the farm, but of the particular crops and fields, when necessary. He should especially be energetic in taking advantage of season and weather, always having something to be executed on the most favourable opportunity, remembering that "economy of time is economy of money," and that, "an hour lost is so much actual cash thrown away."

FARM-HOUSES AND OFFICES.—In the first volume of British Husbandry there are admirable plans of farm buildings, on various scales, but all designed for what in Ireland would be considered a very extensive farmer.

No farmer ever yet found that his offices were too numerous or too *roomy.* There is one deficiency in almost every farm establishment, and that is, the want of accommodation for *poultry*, which ought to be great objects of attention to the females of the farmer's establishment. In all those buildings we recommend tiles or slates; the loss to the land occasioned by thatching, (which, however desirable for the humble labourer, is an intolerable offence against economy on the roof of a farmer's house,) is often very considerable. There is also danger from fire, either accidentally or through the malice of a midnight murderer. The following passage, applied to Ireland, is as critically true as it is admirably expressed:—

> "Respecting the farm-buildings in Ireland, but little remains to be added to the observations already made, and inserted in our introduction to this work. Nothing, generally speaking, can exceed the wretched meanness of the accommodation afforded in this particular, even to farmers in otherwise easy circumstances; and the business of cultivation suffers accordingly throughout all its details, from the want of proper conveniences in the offices. But, although the common class of Irish farmers are generally accused of slovenly habits, this part of their want of management is not so much their fault as that of their landlords; it is in fact but a portion of the bad system of tenantry, and the want of capital, which prevail throughout that country. The main object of the landlord is, with very few exceptions, confined to the one point of obtaining the utmost rent for the ground without regard to the character or means of the tenant; or else, he lets it on any terms by which he can raise a sum for the supply of his pecuniary necessities. He seldom lays out a shilling upon farm offices of any description; the consequence of which is, that the poor tenant, who holds perhaps only a few acres, cannot afford any thing beyond the commonest cottage, with a mud shed adjoining for the shelter of his cow and the pig, or perhaps a stable for his horse, of no better description; and the wealthier order, even of those who hold leases of a considerable quantity of land, being not bound by any conditions regarding expenditure for buildings, nor allowed for repairs, naturally cannot be expected to lay out more money than they can possibly avoid during the existence of the term. There are, no doubt, many instances of superior sets of offices; but they are rarely in the hands of any other than gentlemen of fortune; and the improvements which have occurred in this particular, have, by no means, kept pace with those which have been made in the culture of the soil or the live-stock of the kingdom."*

FARM SERVANTS.—These are either maintained in the farmer's house, with fixed quarterly wages, or accommodated with cottages, or miserable cabins, and the grass of a cow, with other allowances, and certain money payment for each day's labour. The system of having ploughmen and carters to dine at the farmer's table, was very common in old times, when there was more simplicity of character, and less conceit, than in the present day; before the daughters of the farmer—so happily ridiculed by Cobbett—learned to strum upon the spinet, and became too consequential to work in their dairies; but, now that separate tables and separate rooms are kept, except among the class of small holders, it is more usual to employ married labourers and their families, who live in their own cottages, excepting perhaps one or two young men to attend constantly to cattle, and those services necessary at extra hours. There is much to be said for and against the custom of having in-door servants of this kind; young men, well fed and vigorous, and always ready to turn out at a moment's notice, are certainly valuable to their employer, and a lesser incumbrance to him than those who have families to support, and who are less nutritively fed; but, on the other hand, such fellows are often the causes of moral mischief in the employer's family, in which there must be servants of the other sex. Whether such labourers are or are not boarded in the farm-house, the great body of work-people live in their own cottages.

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* British Husbandry, page 111.

Some interesting statements regarding the practice of the farmer, as it affects the condition of the English and Scotch labourer, are given in the first volume of British Husbandry.

The Scotch agriculturist, as if aware of the bad consequences which might arise from paying money wages altogether to his young men, which might tempt them to form injurious habits and associations, places those whom he does not keep under his own roof, in the houses of married labourers, and pays to them part of the earnings of the other in meal and potatoes, which, added to their own allowances in the same articles of food, and some money, renders all parties comfortable.

Servants domesticated with the Scotch farmer have the following dietary:—

BREAKFAST—porridge, (stirabout,) exceedingly well prepared—both as regards the quality of the meal, and the boiling—with skim-milk and oaten-cake, and sweet milk afterwards.

DINNER—broth made of beef, roots, and pearl barley, succeeded by a *second course*, consisting of the beef from which the broth had been made, with potatoes scraped before boiling and mashed with butter; *third course*, oaten-cake and sweet milk.

SUPPER—in summer, sowens and milk; in winter, mashed potatoes with butter, or a slice of good cheese and new milk, all mixed perfectly together, and eaten with a spoon, dipped *at discretion* into a mug of sweet milk.

Potatoes being rarely used for food in Scotland after the month of March, (probably from a deficiency of the keeping kinds,) the supper in spring consists of peas *brose*, which is merely a pudding composed of peas, flour, and boiling water.

The precise allowance given by Mr. Sellar, on his extensive farm in Sutherland, is,

> “During the year, a house and garden, a milk cow, at all times well fed, 13 Scotch bolls, or 16½ cwt. of oatmeal, three Scots bolls, or about three cart-loads of potatoes, a limited quantity of English coals of the best quality, and to each ploughman an average of about £10 wages in money. For the above allowances each family keeps a young man within the house; and if any circumstances put two young men to lodge with one of the families, there is allowed 6½ bolls of oatmeal, one boll of potatoes, 52s. per annum, and some coals, for the additional lodger.
>
> “This of course differs in some places, according to circumstances and agreements. In Berwickshire and some of the bordering counties, where wages usually average higher than in most other parts of the kingdom, each married hind has permission to sow a peck of flax-seed, the hand-culture of which, and of a small potato-crop, devolves upon his wife and children, the ploughing being done by the farmer; and the gains of a family, at the prices of 1806, are thus enumerated—

	£	s.	d.	£	s.	d.
“ Actual allowances in money - -	2	0	0			
Ditto, 60 bushels of oats, at 3s. 6d. -	10	10	0			
Ditto, 24 bushels of barley, at 3s. 6d. -	4	8	0			
Ditto, 6 bushels of peas, at 4s. 8d. -	1	8	0			
				18	16	0
“ Estimated value of the keep of a cow at 6d. per day,	9	2	6			
Ditto, of potatoes, - - -	2	0	0			
Ditto, of flax, - - -	0	10	0			
Ditto, of poultry, - - -	0	10	0			
Ditto, harvest allowances, - -	1	10	0			
Ditto, carriage of 4 cart-loads of coals	1	0	0			
				14	12	6
“ Probable earnings of the wife, 120 days, at 10d.	5	0	0			
Ditto, of two children, ditto, at 8d.	8	0	0			
Ditto, of spinning and barn work during the winter,	4	7	6			
Value of the wife's food during harvest, 28 days, at 10d. - - - -	1	3	4			
				18	10	10
“ Making their yearly earnings amount to -				51	9	4

> Exclusive of the value of the cottage and garden, for which the hind's wife is generally bound to shear during harvest without wages, but with full harvest food, and to work at all customary out-door labour at the common wages of the country.”*

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* British Husbandry.

A *patch* of ground at a fair rent is most desirable for the occupation of surplus labour, (see *Allotment;*) but, as regards a cow, it is better for the farmer to keep her for the labourer, or to sell to his family skim-milk, at market price, than for the other to encumber himself with the maintenance of one, when he can have no means of sufficiently feeding her except by trespassing on his neighbours, or on the high road; in the neighbourhood of a distillery or brewery, the case may be altered. In Ireland, where an acre, or perhaps more, is held by the labourer, he *ought*—if he managed his acre *properly*—to find his account in keeping a cow. But this latter point of observation is somewhat extraneous to the matter immediately in consideration.

The English labourer is paid as follows:—

> "All the females of this class, and sometimes a few of the unmarried men, are boarded by the master, and receive yearly wages besides, varying from £4 to £12, according to their set and capacity. But the married labourers, who reside in cottages of their own, are paid weekly, at various rates, depending partly on the price of provisions, the season, and the custom of the country; in England, almost invariably in money, which, at the ordinary rates of nine to fourteen shillings amounts to—

	£	s.		£	s.		£	s.
"22 weeks, in winter, at 9s.	9	18	at 10s.	11	0	at 12s.	13	4
26 do. in summer, at 10s. 6d.	13	13	at 12s.	15	12	at 14s.	18	14
Harvest month, - -	3	3		3	12		4	4
Ditto, beer and supper (when allowed,) - -	1	1		1	1		1	1
	£27	13		£31	5		£36	13

> For this the usual hours of work are, from sun-rise to sun-set in winter; and in summer from six to six, (except in harvest it is very commonly continued from five in the morning until night,) with intervals of half an hour and an hour at breakfast and dinner; but carters are necessarily employed both earlier and later in the stable."*

The females and boys earn money at task-work, hoeing, &c.; so that the total amount of earnings in the year is usually considerable.

The diet of an English labourer, fed in his employer's house, is of excellent quality,—bread, bacon, cheese, pork, meat pies, beer, and milk, are his daily food.

It is painful now, to contrast with the foregoing statements the sum of earnings by an Irish labourer who has a family. If he be kept in the farmer's house, and a single man, he is well fed, (compared with the extern labourers,) on potatoes and milk, (with stirabout in summer, instead of potatoes,) for breakfast—potatoes, milk, and butter, for dinner, (meat three times a week in some houses;) and potatoes and milk for supper, with money wages from £1 5s. to £2 per quarter; but, if he be married, and without land, his yearly account stands pretty nearly thus:—

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* British Husbandry.

Cr.				Dr.			
By wages at 10d. per *working* day, about -	£12	0	0	To manured land for potatoes and seed - - -	£6	10	0
— Spring and Harvest work by wife or children -	1	10	0	— Milk - - -	1	10	0
— Fowl and eggs sold -	1	10	0	— Meal - - -	1	10	0
— Pig do. - -	2	10	0	— Meat - - -	0	7	0
				— Salt Fish - - -	0	15	0
				— Soap, &c. - - -	0	13	0
				— Priests' Dues - -	0	2	6
				— House Rent - -	1	10	0
				— Fuel - - -	1	0	0
				— Clothes, &c. &c. -	3	12	6
	17	10	0		17	10	0

The labourer who lives at home has, in nineteen cases out of twenty, no other food than potatoes, without any condiment whatever except a *taste* of salt-herring occasionally, three times a day, during the winter and early spring months, and potatoes and butter-milk during the remainder of the year, for all his meals, varied perhaps in the months of June and July, with stirabout or coarse wheaten or oaten-bread for breakfast.

He may have grown-up sons earning wages also, in which case, while they remain unmarried and under his roof, his condition is comparatively comfortable; but he cannot calculate on any earnings by his wife or children, of either sex, except for a very few days in the year, in a country where hand-hoeing is unknown.

Though potatoes constitute the principal, if not the sole food of the Irish labourer, the farmers rarely enable them to plant the crop in fit season, or in a profitable manner. From a very illiberal motive, some require that the crop shall be planted in beds instead of drills. For example, in the vicinity of Kilkenny the farmers (as elsewhere) are in the habit of giving ground for a potato crop, during the season, rent free, in consideration of the manure to be supplied by the labouring poor, who collect and hoard it with much anxious industry, in expectation of the demand for it by the farmers who may not have sufficient supplies from their own yards. These ungenerously take advantage of the manure, pressingly offered by those whose existence depends on a potato crop, and insist on having at the rate of 200 car-loads to the acre, and bargain that the land shall not be ploughed in *drills*, but in *beds*, for in this case a larger portion of manure must be given, and the ground is less exhausted. These hard-hearted farmers, with a keen desire that the manure shall not be fully incorporated with the land during the first crop, in which they have no interest, prevent the necessary tillage, and still farther to restrain the productiveness of the soil, they postpone until all their own work is completed, the carting of this tributary manure to the allotments for which it is designed, until the end of May or June.

The cottier, instead of being allowed his wages of 10d per day, sometimes diets regularly with his employer—that is, receives two meals a day, in consideration of which feeding, 5d. or 6d. is to be deducted from his daily wages. The balance is put to his credit as a set-off against the exorbitant rent which he undertakes to pay for his wretched house, acre of land, &c. originally chosen for him from its inferiority of quality, and this is probably worn out from successive crops of ill-manured potatoes, and produces but half a crop of the root which constitutes his food.

FATTENING CATTLE.—The nature and functions of the stomach—that great laboratory which Providence has given to the ox for the reception and conversion into nourishment of the food which renders him so valuable to man—must be briefly explained, before the quantity or quality of his food is taken into consideration.

This great workshop consists of four distinct apartments, in each of which a particular process is carried on. These are in fact separate stomachs, acting, not like the belly and the members in the apologue, on principles of sulkiness and disunion, but with the most perfect sympathy and co-operation of powers.

The ox, or the cow, as the more familiar term, wraps her rough tongue round a bunch of grass, or a handful of hay, (for, being without teeth, (incisors,) in the fore part of her upper jaw, she cannot be said to bite it,) which she holds pressed against her hard gums by the front teeth in the lower jaw until it is sufficiently divided and wetted into a pellet for its passage through the gullet into the paunch, or *rumen*, which is the largest compartment of the suite of stomachs. The aperture through which it falls into this, out of the gullet, opens also into the second stomach. The action of the coats of the rumen, which are rough and uneven, with little prominences for the maceration of the food, prepares it for another process in the second stomach—called the reticulum, or honeycomb—into which it is sent forward, through a smooth gutter or channel, by a convulsive motion. In this kitchen the food is covered with a kind of sauce or mucus, to prepare it for mastication in the mouth, to which it is served up by the agency of certain spiral muscles, which are the moving machinery of the food upwards and downwards. After the act of chewing the cud, or rumination, has taken place in the mouth, down comes the provision again, but by a beautiful contrivance it now falls not into the first or second cavity, as before, but into the third of the series, for in the act of its descent now, the two first cavities are closed by the approximation and apposition of its margins, by which at the same time the continuity of the gullet into the *third* stomach is completed, and the two former ones are shut out from communication with the passage. The third stomach, which still more macerates the food passed into it, is called the maniplies or many folds, and is coated with little irregularities resembling millet seed. From this the well-prepared mass is propelled into the fourth apartment, which is the true stomach, for here the digestion takes place, by means of the gastric juices, and from this room, nourishment is distributed to the whole system, by means of the chyle into which the well-prepared food is now converted.

It is this fourth stomach, with milk curdled in it, which is commonly termed rennet; but after the days of *calfhood*, when other juices enter into it, this coagulation does not take place.

By the Creator's admirable design the contents of the stomachs never return through the range, in consequence of trap-doors or closing-valves. This explains the reason why cows cannot be made to vomit, unless under circumstances of violent and unnatural convulsion, which would be fatal in its consequences. Having premised the mode by which the family of the ox take and digest their nourishment, it remains to consider the nature of the food which should be given to them, and the kind of preparation which renders it most nutritive. This is effected either by grazing in rich pastures, or by stall-feeding. In the former case, the custom is to put the fattening stock to good grass in May, in which case they will be fit for the market, in three, four, or six months, according to their age and condition when going to grass. Beef fed on natural grass, where the beasts have liberty to choose for themselves, (with shelter from wind and sun,) is certainly the most delicate in flavour. Strong and weak cattle should not be put together, as the latter may be injured by the superior strength and *high animal spirits* of the others. Those animals that are inclined to gore, should have the points of their horns tipped. Care should be taken that the cows are perfectly dry when going to pasture, else the fresh green food will soon renew their milking powers; their udders should be washed with vinegar, if a single white drop of milk remains. No grazier will buy very old cows if he can well avoid it, nor those of a form unlikely to take flesh. The short-horned breed, and the Ayrshire, are invaluable for the grazier, from their propensity to fatten.

"With respect to the changing from one enclosure to another, attend to it particularly, and when you make the change it will be found excellent economy to crowd into that you have vacated, double the number at least, of store bullocks, or other stock, to eat down as close and quick as possible the refuse grass, which would not only go to loss, by the next time your field was ready for another turn, as it would become wiry and hard, and prevent kind and tender grass from growing in its place, which would be softer, more full of nutriment, and similar to after-grass. The crowding of stock I advise, for the purpose of eating it down quickly, in a week if possible, in order to take up the field again for a second turn upon it. Bullocks and horses are the best cattle to put in upon such, as they will browse best on coarse grass, and take a full bite.

"Suppose you put 20 cows into a reserved field of 12 acres on the 1st of June; if the land is prime, it will answer them until near the 1st of July, but a quantity of long refuse grass will probably remain; on this it is that I propose turning in for the first week after the removal of your fattening stock, at least 40 bullocks, to remain till they eat down the grass only; if in a week, so much the better; drive off the stores then, say by the 8th of July, and the enclosure must be preserved until the end of August, when you will have another round of clean fresh grass for your fat stock. There is no waste by following this method, and it will be found highly beneficial to the stock, as well as the best economy. Two or three turns by good management will be had out of each field during the summer and autumn. To those extensive in the dairy line I would advise the same practice. Good enclosures for this, as well as many other reasons, will enhance the value of a farm much. The closer and more evenly your pastures are eaten down, the kinder and better they become; and when grass grows too freely of a wet year, it will be inferior in fattening qualities to that of a dry."*

But the most advantageous mode is to fatten in stalls, for economy of land and accumulation of manure. In this way cattle are sometimes fattened during the summer, on leguminous crops, mown and brought to the byre,† and always in winter, on turnips, potatoes, &c.

The usual period for commencing this course is on the 1st of November, when the fattening stock should have at first only a stone of turnips, cattle-beet, or potatoes at each meal, for the first week, and then gradually the allowance should be increased from two stone to three stone, or even more—three times a day—according to the size of the animal. Potatoes, however, being considerably more nutritive than the other roots, should be given in smaller quantities. Some advocates for potatoes go so far as to say that the produce of one acre of them equals that of three acres of turnips for cattle-feeding. We doubt it, especially if Swedish turnips enter into the calculation.

A sufficient supply of turnips for two or three days should always be in the house, to prevent the necessity of drawing them in wet weather or in frost, if they be left out during the whole winter, which, as regards the Swedish kind, may always be done in a *mild* climate.

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* Lambert's Rural Affairs of Ireland.

† The daily addition of a few handfuls of shelled barley, wetted with water, greatly accelerates the putting on of flesh when cattle are fed with green food.

The more delicate kinds should be housed.

The system of management is as follows: at six or seven o'clock in the morning the dung is removed from behind the cattle,* and a feed of turnips is given to each animal; and while the feeding goes on, the manure is wheeled to the dung-pit; after this, about four pounds of sweet, soft hay, or if this cannot be had, straw, fresh from the flail, is thrown to each beast. After this breakfast, a currying occasionally, and a good littering, they lie down and chew the cud. In the middle of the day and in the evening the same feeding takes place, with, however, a larger allowance of hay, oat, or wheat straw for the night. It is a good plan, when potatoes are also available, to give them every alternate day, or alternate week; if they occasion looseness, the feeds must be proportionably diminished. With many persons it is unusual to cut the turnips, unless they are exceedingly large; but it is *better* to chop or slice them; a man and boy with a *slicing machine* will cut, in one hour, a very considerable supply, and old cows will find great relief from being saved the labour of exercising toothless gums. The tap-roots and green-tops should, in all cases, be cut off and given to young store-cattle, and the remainder well scraped, to remove the clay which may have adhered from the field. *Large* round potatoes will not choke any beast; but small ones are extremely dangerous, as they are sometimes bolted without mastication. These should always be sliced or bruised. Water should not be given while there is a sufficient allowance of raw potatoes or turnips. These roots, however, will fatten much sooner if *steamed.* There is no doubt upon this point; and where a steam apparatus is at hand, it should be regularly used. Those only who have tried the experiment fairly can duly estimate the saving in consequence. Oil-cake is used much in fattening cattle, but it destroys the flavour of meat; the proportion used is about two pounds per day, when combined with other food; if given with straw or hay alone, twelve pounds per day may be given to a large beast.†

Mr. John Brodie, near Haddington, in a Report to the East Lothian Agricultural Society, gave, in 1837, an accurate detail of experiments made in the fattening of twenty Aberdeenshire polled cattle, divided into lots of four each. The following is an abstract of the details:—

Lot 1, fed on turnips and straw.

Lot 2, on turnips, oil-cake, and straw.

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* See Low's Elements.

† See Quarterly Journal of Agriculture, No. 39.

Lot 3, on turnips, bean-meal, and bruised oats and straw.

Lot 4, on distillery grains, ground beans, and straw.

The feeding of lot 2, was *the least expensive,* (they obstinately refused oil-cake for ten or twelve days, until their allowance of turnips was taken away and water substituted,) and they made the greatest improvement, being estimated at £88 10s. in April, 1836, when the value of the lots was as follows:—

		£	s.		£	s.	d.
“Lot 1,	value	82	0	Cost of keep from October to June,	48	9	10
Lot 2,	-	88	10	- - - -	48	16	0
Lot 3,	-	77	0	- - - -	58	8	1
Lot 4,	-	81	10	- - - -	63	3	2

It appears from those experiments “that the winter-feeding of cattle is more capable of successful extension by those who have a sufficiency of straw, but who have not such abundance of turnips as to be able to make all their straw into manure by cattle upon full feeding, than was formerly imagined.” The oil-cake is the valuable auxiliary.

Salt should be given every day with turnips, potatoes, &c., from three to four ounces per day, according to age and size.

In Great Britain and Ireland very few farmers are in the habit of giving salt to their farm stock, though its excellent effects are appreciated in North America, where its use is general. Whether it is that the dryness of the atmosphere, in the interior of that continent, and the distance from the saline deposits of the ocean, render it more necessary than with us who are surrounded by the sea, or that the Americans have more regard to the appetites and tastes of their cattle than we have, the fact is unquestioned that they do “salt their cattle” very regularly and abundantly. The avidity with which it is devoured by cattle and sheep is astonishing. A drove of cattle may be brought together in an incredibly short time at the call of the person who is in the habit of giving salt to them. The slightest hint that a lick of salt is to be had is sufficient to set them scampering towards the place of distribution. An eye-witness relates that “with regard to cattle it is sometimes hardly safe to venture into an open pasture with salt in your possession; for so eager are they to obtain it, that they do not allow time for your depositing it upon the places intended for it, or even upon the ground if nothing else is at hand. Huge oxen, with long formidable horns, are rather rough companions when they press closely around you; and it sometimes happens that you experience much difficulty in getting your formidable friends satisfied.” A rampant cow, forcibly poking her horns into a man's pockets for salt, must certainly be a great bore, and rather dangerous to boot. (See *Salt.*)

FEEDING—With respect to dairy-cattle, working-oxen, and store-heifers and bullocks, must be regulated by circumstances: it is, however, miserable economy to stint any of them. What can be expected from any class of cattle if they be insufficiently fed? The dairy-cow in summer should have either good pasture, or what is more consistent with economical management, plenty of succulent food brought to her byre and given in small quantities every alternate hour. The same management is desirable for every other description of horned cattle; and in winter—if giving milk—beet-root, rape, turnips, or grains, with sweet hay, or fresh straw, should be supplied to the milch cow. Working oxen are often shamefully treated in the article of food; they should have potatoes or turnips regularly in winter three times a day, with a sheaf or two of oats occasionally, and good hay, or fresh straw; in the latter case they will require more turnips than with hay. It is a common practice to give nothing better than wheaten straw to young cattle in a fodder-yard during the whole winter; but though some cattle will live upon this feeding without showing manifestations of starvation and disease, it is obvious that they would be in much better condition, and doubtless would pay their owners better, by having turnips or rape, at least twice a day. Those who have the finer breeds, feed the yearlings and two-year-old three times a day with turnips; if they diminish the quantity for any class of those animals, it is in the second winter; but they take care not to let them *lose* condition, though they may not gain in it. For heifers intended for breeding such a quantity only should be given of nutritious food as will preserve their health without allowing them to fall into flesh. It is impossible that they can properly mature their growth, or be fit for early profit if deprived of nutritive food. The short-horn breed having an especial tendency to fattening, and being mature at a very early age, should be well fed *from the hour of their birth.*

It is lamentable to see the poor condition in which yearlings and two-year-olds are often sent from the fodder-yard to pasture.

FENCES.—These are of various kinds: walls, paling, thorn-hedges, furze-banks, and open ditches.

Walls, where stones are plentiful, and the growth of hedges is slow, are the most economical as well as the best fences. They occasion but a trivial loss of land, and while they afford shelter to crops, they do not overshadow them. It must be admitted, however, that they are very ugly. Dry walls, excepting the upper course, which should be built with mortar, and well coped, are very permanent, and if broken, easily repaired; even round grit stones, in the hands of an expert labourer, make an excellent fence, more secure against trespass than any hedge. Where flat quarry-stones are convenient, the work can be effected with proportional ease and perfection. From four and a half to five feet, especially if the coping be of thin and angular stones irregularly placed and bedded in mortar, bids defiance to man or beast. The common dry-wall mason is a most valuable tradesman in a stony district.

> "In the province of Connaught, masons of this kind are every where to be found; and they build their walls without mortar, with nearly the accuracy and closeness of house-masons.
>
> They build by a frame two and a half feet at the bottom, and eighteen inches at top—these are the dimensions suitable to a permanent wall of six feet in height, which is usually coped by two substantial sods of three inches each in thickness—the first is laid with its grassy side down, on about an inch of level mould on the top of the wall; and the second inverted upon that, with the herbage uppermost. This species of fence, with very little attention paid to it, will be safe at the end of fifty years.

	£	s.	d.
"Stones per running perch, - - -	0	0	4
Mason-work, per ditto, - - -	0	1	6
Sod-coping, per ditto, - - -	0	0	1
	0	1	11

> "In proportion to the diminution of height, will be that of width; and also the reduction of cost in the quarrying and drawing, as also in the wages of the mason. In many situations, not subject to the emulative feats of gallant sportsmen, a wall of five feet, which would be much less costly, might be deemed sufficient, or even of four and a half feet solid, or (still cheaper) pinned and dashed with a mortar coping of nine inches."*

In many parts of England walls of mud and straw are used about the farmer's house and yard, with a thatched eve; they last some time, if not exposed to severe frost, which soon crumbles them away; at best they are not very durable, and are much less permanent than wooden walls or paling, where timber is abundant and cheap.

Whitethorn hedges are the most desirable, (undoubtedly so for beauty,) and the most permanent, next to stone walls. The manner of planting them in most parts of Great Britain is this—after the line has been marked out, well dug, and raised a little above the level of the surface, by a shallow trench from each side, the plants are put down; on clay soils the trench is much deeper on one side, and a bank higher than the young hedge is raised at the other side. Two rows of plants, three or four years old, are put down, with the interval of four inches in each row, and of a foot between the rows. They are then cut down level with the ground, and a double or treble bar railing is put up and preserved in its position for six or seven years, when the plants can take care of themselves. When they are removed, the narrow ditch is scoured, and the clay raised from it is banked up on the original back. After the second winter the quicks are again cut down within an inch or two of the ground—but the utility of this practice is questionable—the fresh shoots will then be four, five, or six, to each plant, and will sometimes grow nearly a yard in one season.

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* Martin Doyle's Address to Landlords.

The mode of making thorn-hedges in Ireland (where, from the scarceness of timber, and still more from the spoliation to which it would be liable for fuel, paling is generally unavailable) is as follows:

> "The direction of the fence being determined, the line is laid, and a cut made along it; five feet from this line, on each side, a similar cut is made. One of the spaces so marked is to be the dyke, and the other the seat of the ditch. A sod, as a foundation for the ditch, is then laid, (*there should be an off-set or scarcement of a few inches,*) with the grass side down on the surface of the ground, along the cut; the surface soil is then laid on, to the depth of about six inches, upon which the quicks are laid at about a foot apart; supposing them, as before, to be three years old, they should be placed in such a position, inclined upwards, that the rain may trickle down the stem to the roots; and, unless the soil be very good, some compost or good earth should be put in contact with the roots. A common practice is, to lay in a tree of some kind, one in each perch of the ditch; this practice has given England an appearance of one immense plantation, but it is not to be recommended unless in high and cold situations, where shelter is a principal object; but in low and sheltered places, the trees injure alike the hedge and the crop in their vicinity, and ought not to be encouraged."
>
> "Some recommend to head down thorns (besides the first heading when planted) as soon as they have attained a height of two or three feet; but *by this practice, although the hedge is thickened, it is proportionably weakened.* Those plants which are observed greatly to overtop those that are weaker, may be headed down, and their extra luxuriance will enable them soon to overtake the others; but except this, the hedge should be permitted to grow until it has become sufficiently strong to turn cattle, it may then be headed in to about four feet high; and henceforward it is to be trimmed as well on the top as on the sides."*

It is usual to lay a row of field stones under the thorn quicks (laid horizontally) and another immediately over them, in order to prevent weeds, as much as possible, from growing about the shoots. Weeding should be looked to very carefully for two years, after which the plants will require no farther care on this point. These Irish hedge banks are sometimes double, and if so, very frequently have a sowing of furze-seed on the top, which is tapered up to the breadth of eighteen inches. When single, furze-seed is sown at the back of the bank, or furze-quicks are planted there. Mr. Bell, to whom the Highland and Agricultural Society of Scotland voted the society's honorary silver medal for an essay "On the Whin as a Fence," states that he had "an old thorn-hedge planted in 1790, which had defied the care and attention of every successive hedger. It was eaten up with the yellow canker and was rather a straggling collection of stunted thorn plants, than what might be termed a hedge. The whin was sown at the back of the hedge, which came up freely; and in place of injuring the thorn, it put forth fresh shoots, became healthy and vigorous, and a strong fence in a few years." He recommends, however, that the thorn should have a start of three years.

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* Irish Farmer's Magazine, No. 22.

The mere furze banks, whether single or double, are made precisely in the same way as if they were designed for the hedge-fences described by Mr. Murphy. There are usually two rows of furze sown or planted when thorns do not occupy the front, one on the top of the bank, and the other on the middle of the back.

An average of two shillings and six pence per perch will complete these fences, planted in the breast with white-thorn quicks of proper age, four inches asunder, and interspersed with ash, elm, and Canada poplar, at intervals of twenty-one feet, the mere rearing of which, in the landlord's nursery, would afford a considerable degree of employment to men, women, and children.

The waste of land—particularly if it be of such a nature as not to require these ditches as drains for superfluous moisture—is very considerable; even a single fence of this kind occupies, with ditch and bank, eight or ten feet. If the soil be dry, the ditch may be sloped down, however, so as to allow grass to grow on the surface. Those banks should be thrown up at the inclination of forty-five degrees, or very near it; if nearer to a right angle in their slope, they will not stand permanently, but will gradually, if not suddenly, come down. When the face of these banks (as is not often the case in Ireland) is made of sods or turf, the grassy side ought to be placed outwards; for if the sods be laid upon each other with the green side downwards, the grass can only grow between the joints, the remainder of it dies, the sod rots, and the whole front crumbles off. The only return which the farmer receives from furze-banks is a supply of faggots every three years; and this is certainly a very important matter in districts where other fuel is dear. In many parts of Ireland the poor, in winter, would die of cold and hunger if those furze-banks were removed. In situations exposed to the sea blast, or at a high elevation where thorns would not grow, these fences are very valuable for shelter. On a bare, cold mountain the trembling cattle find comfort and repose in the dry ditch (elsewhere wasteful) with a warm evergreen screen over and behind them. And *if* instead of being cut down periodically for fuel, they were trimmed close every year in May or June, September or October, and in the form of thorn-hedges, they would be rendered most desirable both for utility and beauty, especially in exposed places. No hedge is so close as this; and being green through the winter, it would, if of regular and uniform shape, be exceedingly handsome. *With annual clipping* a furze-hedge will last for a prodigious length of time. Nor will it, if trimmed, injure the adjoining headlands by shedding seed, for the bloom which takes place (and this is only on wood of two years' growth) is in the interior of the hedge—consequently the seed is deposited there. In stony places the whole front of the bank is usually composed of stones, and the earth from the ditch is thrown behind them to form the back.

Any of the foregoing single fences answer remarkably well for securing the front of plantations; trees can be planted in the back part, and furze-quicks on the summit. No beast will assail them in front if they be properly made; and there is no danger of an assault from the inner side.

Furze-fences, however, *if neglected*, last only for a few years in *perfection;* the earth becomes dry and sapless, and gradually fails to cohere; and the whins become stunted and feeble, and when bared by the bill-hook, the bank presents no formidable obstacle to cattle. The aspect of the country is often disgustingly injured by the *artificial* wildness exhibited by crooked and ill-constructed boundaries of furze-fences, insufficient in every particular for the purposes which they are intended to answer.

The hedge-row, until it attains *an extreme degree* of old age, can be renewed in vigour by cutting and plashing; and therefore on this account, if on no other, is far preferable.

In rich grazing districts especially, where thorn or furze-quicks (if they happen to exist at all) are not preserved from cattle, bank-fences, with a mere straggling thorn here and there, are frequently seen. As fences, these mounds are useless, having no bearded front to oppose to cattle; and besides this essential want, they have usually open gaps at short intervals from each other. We could name counties near Dublin where such waste of land is permitted. No bank of this kind is ever seen in Flanders, except the dykes to guard against inundation.

In marshes, open ditches (if always full of water and sufficiently wide) are excellent boundaries, and serve a double purpose. On such land hawthorn will not succeed; banks planted thickly with willows of various species, entwined together, make the most suitable fence. This is very common in Belgium, where the ditches are often necessarily very numerous, but the earth dug out from the ditches is thrown over the field which it helps to raise, and the alder and poplar planted by their margins absorb much of the moisture, while they are ornamental and useful also.

Sunk fences need not be particularly referred to, as they are easily formed by any one who has ever seen them, and are not usual for the mere farmer's purposes. As boundaries in a lawn or demesne, where it is desirable to have an apparent and yet not real extent of undivided land, they are the very best fences. Hurdles, so much used in England for enclosing sheep on turnip fields, are often very useful for temporary enclosures of any kind, and if made of durable timber, and carefully put up when not required for use, they last a considerable time.

FIORIN.—Professor Low thus describes it:—

> " *Agrostis alba*, marsh bent-grass, is one of the species of *agrostis* which grow on moist soils, and which, having generally creeping roots or stolons, form frequently troublesome weeds. It sometimes passes under the name of black couch-grass. When it takes possession of wet, clayey soils, its roots penetrate to a considerable depth, and from their vivacious properties it is very difficult to extirpate them. In more favourable circumstances, the marsh bent-grass grows with broader leaves, and assumes the appearance of one of the superior grasses. It was under this form that it was introduced to notice as a beneficial object of cultivation under the name of fiorin grass. It grows naturally in the moister soils, and extends itself sometimes to the extirpation of less powerful grasses, by its creeping roots and stolons. Its best property as a pasture grass is the late period at which it rises in the season, affording food when other grasses have ceased to grow, and in spring, also, it affords an early herbage. These properties may render it sometimes expedient to cultivate this plant in small quantity, mixed with other grasses, when the object is perennial herbage, and especially in the case of irrigated meadows; but otherwise it does not possess properties to entitle it to be ranked amongst the superior grasses."

We have always heard it termed the *agrostis stolonifera*, and are surprised that any persons of experience should sometimes mistake fiorin for black couch-grass, (though the Woburn reports make a similar remark,) which it in no remarkable way resembles, and from which, in some respects, it is essentially different. Fiorin is a soft, silky-like grass, with a very narrow leaf, (as we have found it,) and not creeping with its jointed roots *under* the surface; it is very easily pulled out, and has not those knotted and vivacious roots which characterise black couch.

The Rev. Dr. Richardson, of Clonfecle, in the county of Tyrone, was the person who, about twenty-five years ago, first called remarkable attention to fiorin grass. That gentleman laboured with great zeal by his writings and his practice on a large scale, to prove the superiority of this grass to every other, for meadow purposes. One of his modes of propagating fiorin was to plant the stoles of the grass—which are as vivacious as those of couch grass—on fallow ground, and thus create a meadow; but his favourite and most expeditious system was to encourage its spontaneous growth on alluvial and flat peaty ground; and on all cold, sour, stiff meadows, the surface of which he scarified, and in which he made frequent shallow drains, giving a top-dressing with the compost composed of the stuff thrown out of the drains, mixed with lime or dung. Wherever a coarse intruder appeared, it was carefully eradicated, and no beast was at any period of the year suffered to graze on the land. Unquestionably Dr. Richardson did exhibit extraordinary crops of fiorin on the levelled surface of denuded and cut out bog-land previously of little value; nor was his the experiment of a year or two—for several consecutive years he mowed enormous crops. Some of the doctor's pupils in the school of fiorin culture went at the same time to the length of asserting that though this grass succeeded best on reclaimed bog, it produced very heavy crops on dry, upland ground; and that if unmown at the proper season—autumn—and allowed to stand over during the winter, it neither rotted nor lost any of its good qualities, and became a substitute for turnips, mangel-wurzel, or rape!!!

The fact is, that fiorin is one of the indigenous grasses of Ireland, especially on peaty soil. It is seen abundantly on the black, shallow bogs, which have been drained in any degree, and especially on the margins of pools or ditches. Cows relish it much if it be not soured by stagnant water, and yield milk abundantly when fed upon it.

However, though it has produced from six to ten tons per acre, if top-dressed and preserved from the poaching of cattle, the attempt to keep any land under the occupation of this grass for meadows, to the exclusion of all others, has been totally abandoned. Two great objections to fiorin are, the difficulty of mowing it, as it lies flat and entangled, and of saving it at the very late season when it is ripe for the scythe.

FLAX.—In this article we follow the order of arrangement in Mr. Pooler's Manual, and give some part of the matter from the same source, premising that the practice and management pursued in the north of Ireland, and in the Netherlands, ought to be our guide, for in those parts of Europe the growth and treatment of flax is best understood.

Soil.—Alluvial land, if not too rich, (in which case the crop will lodge,) is the best quality; loam of middling quality, suited to wheat crops, and not too highly manured, is excellent, but flax will grow exceedingly well on cold soil, with argillaceous bottom, if in good heart and well pulverized and drained, as is well known by the farmers of Londonderry. It will not succeed on peaty or gravelly soils, (unless when the subsoil is of clay, and within twelve or fourteen inches of the surface,) which part too readily with their moisture, and want the cohesiveness which flax requires, nor in soil of the opposite extreme, which, in winter, holds its moisture until the land becomes saturated and spongy, and in time of drought is hard and full of cracks and fissures. In short, land of medium quality, if free from couch-grass and other weeds, and not confined by a hedge or plantation, will answer well.

PREPARATION—In the north of Ireland, flax generally succeeds potatoes—always, with the poorer classes. In this case, the winter-fallow is merely furrowed with the spade and shovel, or plough, rarely ribbed up as it ought to be, and harrowed down in the spring without any ploughing, it being considered better to sow the seed on the surface, which has been exposed to the winter after a crop of potatoes, which leaves the richest part of the land on the surface; but in stiff land a good ploughing is necessary. The system of having flax after potatoes or turnips is not considered judicious. Mr. Aiton says, that in Scotland—

> "Many of the most intelligent farmers, disapprove of sowing flax after those crops, and that opinion seems to be supported by experience." He states, "that the most common preparation for flax in Scotland, and indeed the best that has yet been discovered, is to sow oats as a lea crop, and flax as the second crop. If the land is very rich, two crops may be taken; say beans as the first, oats for the second, and flax for the third crop; or if the ground is not in danger of becoming foul, oats for the first crop, beans for the second, and oats for the third, to be followed with flax. And if the land is very poor, it may be manured on the sward, so as to secure a good crop of oats, and give a fair chance of good flax the crop after oats."*

WHEAT is the preparatory crop in Belgium and Holland, but not always. The same preparation now most approved of by the most experienced flax-growers, (sowing on ley,) is practised by some farmers in Flanders. Mr. Radcliff thus reports:—

> "Quintens was the first farmer who introduced into that part of the country the culture of flax upon old meadows and pasture, thus availing himself of a profitable crop to which those strong lands are, by any other mode of culture, unsuited; he has also contrived to procure it in the least expensive manner, as the preparation for another equally beneficial crop to succeed it in the same year. Upon one light ploughing in March the flax is sown and harrowed in. It is pulled in July: a deep furrow is immediately given, and rape-seed sown upon the single ploughing. Where soil and circumstances suit, this seems to be a most advantageous manner of commencing a course of tillage upon old and rich ley ground. As far as the flax crop, I have known it to succeed perfectly in Ireland; but except in this part of Flanders, have never heard of its being followed by rape. When a good market offers for the produce of both crops, (always the case in this country,) this appears to be most judicious management, the latter crop becoming, as it were, the first of the usual course above mentioned for tillage ground; and the flax being substituted,

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* Quarterly Journal of Agriculture, No. 20.

upon one ploughing without manure, instead of a manured fallow after many ploughings."*

We are of opinion that the ploughing should not be deferred until March. Exposure to atmospheric influence in the two preceding months must have a beneficial effect on the surface.

Oats on old ley pastures often fail from the attacks of the wireworm; the substitution of flax for the first crop may be therefore often beneficial. The ground should always be well harrowed with ordinary harrows before the seed is sown, and afterwards with harrows having short teeth.

Seed—"Seed should be of a bright colour, with a sweet taste, and feel fresh and oily. It should be smooth, slippery, and plump, and on being broken should appear of a greenish yellow colour. The weightiest kinds have also been considered the best; but it may be mentioned that about four and a half pounds per fourth part of a peck, is what genuine seed should weigh—it should be so heavy as to sink in water. Riga seed will, however, weigh six ounces lighter. Unfortunately it has not been the practice of the Irish farmer to save his own seed, and, of course, he has to depend on a foreign market and on foreign industry and skill for his annual supply. That this is a very considerable hardship, it has not, we believe, been attempted to deny. Still, however, the evil is allowed to proceed. The saving of flax-seed should be encouraged by all means, and even enforced. Home-saved seed has been found to succeed as well, and in many cases better than foreign; and the frauds of *the trade* would not, in this case, stare the farmer in the face, as difficulties which it is impossible for him to surmount."†

We import vast quantities of seed from America, Riga, and Holland. The Dutch import only from Riga, and according to Mr. Aiton—

"The sagacious Dutchmen have found out a species of seed for their own use, that is of twice the value to them of the seed they send over to us; and if our farmers were at due pains, they might either raise the best seed for themselves, or find out how the seed of one crop was in Holland of double the value of that of the next crop from the same seed, and raise what was found to be the most valuable. If the inferiority of the third year's growth, in Holland, proceeded merely from its being sown too often on the same species of soil, (for they have but one soil in the greatest part of Holland,) it would show the necessity of attending more than we do in Scotland to the change of soil, and, of course, to the raising of their flax-seed at home—as otherwise they cannot know on what species of soil it has been raised. Our soil and climate are as favourable as any other for raising flax-seed of good quality, provided we were as careful as the Dutch are, to sow our flax thicker on the ground, that none of it should send out branches, bearing capsules of inferior growth, and that do not ripen so soon as the seeds on the principal stem;

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* Report on the Agriculture of Eastern and Western Flanders, by the Rev. Thomas Radcliff.

† Pooler's Manual.

and that the seeds may be allowed to become ripe, and be dried on the stems; for it is not possible to dry the seed rightly any other way, or even to keep it so well, if it is removed from the capsules.

"In order to raise flax-seed of good quality, the flax should be sown so thick on the ground, that none of it send out branches, or have many capsules on one stem. It should not be pulled till the seeds are ripe, the bolls or capsules have become yellow, and the leaves or foliage have withered, and begun to drop from the stems. And that is the proper time for the lint to be pulled also, provided it has not grown too coarse and too thin on the ground.*

"Indeed, the only safe way of drying flax-seed is on the stems, as is done in France, Belgium, and Holland."†

WEEDING—This should be executed when the stems are about three inches over ground.

"Every prudent farmer will avoid sowing flax on land, with roots of couch-grass or other weeds that have roots or stolons spreading in or over the soil; as these cannot be torn out without injuring the flax. There is little difficulty, however, in pulling out the ordinary weeds of annual growth, and which ought to be done with great care. Where annual weeds abound, the expense of pulling them out ought not to be grudged, as the ground cannot be so cheaply and effectually relieved of them in any other way. Hand-weeding is not so expensive as a course of summer-fallow. All sorts of crops are carefully hand-weeded in Holland, Belgium, and France; and this is the greatest superiority that the farmers in these countries display over their brethren in Britain. From the month of April to the end of June you may see groups of people, of both sexes and of every age able to pull weeds, lying or standing on one species of crop or another, either hand-weeding or hoeing with the greatest care."‡

TIME OF PULLING—"The proper time for pulling flax (*not intended for seed*) is, when about two-thirds of the stalk is observed to turn yellow, and to lose the leaves. By pulling the crop in a green state, a finer article has by many been considered as ensured to the grower. This expectation has, however, been almost always followed by woeful disappointment. The fineness of the fibre is not *dependent on early pulling*, and a too scrupulous observation of this practice will invariably be productive of an article tender in proportion to its premature removal from the earth, and unable to stand the various operations of scutching, heckling, &c. It is also a very common practice to commit the flax to the water on the same day it is pulled, which is, to say the best of it, extremely injudicious. If the flax be suffered to remain beyond the time pointed out for pulling, the oily properties escape, and the quality becomes injured."§

If intended for seed, the flax should not be pulled until the capsules have acquired a brown colour, (according to the practice in the Netherlands,) and become firm with their points, so sharp as to fix themselves in the hand that presses them; and until nearly all the leaves or foliage have fallen from the stems, or become yellow and begun to wither.

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* Quarterly Journal of Agriculture, No. 20.

† Ibid.

‡ Ibid.

§ Pooler's Manual.

Flax should not be pulled when damp, and any part which has lodged, should be pulled and kept by itself, as it will not have strength to undergo the subsequent operations with the other and stouter parts of the crop.

SAVING THE SEED AND RIPPLING—"There is much difference of opinion even amongst the most practical and intelligent growers upon this subject—some maintaining that in all cases it is highly injurious to the fibre to allow the plant to ripen its seed before pulling; whilst others assert that if proper attention be paid to the *steeping*, no injury whatever will be sustained by the crop, and that it is altogether owing to the imperfect mode of performing this most important operation, that such sums of money are lost in this country in the purchase of foreign seed. The practice of the Netherlands appears to be conclusive on this head, where the seed is always saved, which produces an extensive annual revenue to the country, while the flax, from which it was saved, sells in the English market from thirty to forty per cent. higher than that of Irish growth, from which the seed has not been saved."*

RIPPLING—"The seed of flax is always taken off on the continent and preserved, either to be sown, or to be bruised for oil, or given to cattle; and it betrays great want of industry to do otherwise in any country; it is too valuable for the oil it contains, and as food for cattle, to allow any part of it to be lost. It is of great value, both as food and as medicine for cattle, and particularly for horses. From the extraordinary labour performed by cart and road-horses, and the high feeding they require, they are often subject to inflammation of the blood and intestines, by which much property is lost. But if the proprietors of horses could be induced to give each of them a single handful of linseed daily, or occasionally, boiled with beans or other food, it would operate as an antidote or a cure to those inflammations by which so many horses are lost. But instead of this, the Scotch farmers throw away their flax-seed in the water in which they steep their lint, where it serves to poison the fishes, and render the water and the air unwholesome, as well as to injure the flax.

"The seed, when once properly dried on the flax, may be removed by rippling, or by threshing, or by beating it; always taking care not to rub or hurt the flax when removing the seed. When once the flax and seed have been dried together, the flax is not so easily hurt as when it is green and damp; still it should not be rubbed or handled roughly, as the lint is easily hurt by handling.

"Some have objected to the method of drying the flax before it is steeped, as they say that it makes the lint coarse and harsh, more difficult to be watered, and longer kept from the market.

"The two first of these objections are obviated by the superior quality of the continental flax to ours, though it is all dried in Holland, Belgium, &c., before it is put in steep. And, except when the seed is to be sown, it may be removed, so as to get the lint steeped before the winter sets in."

WATERING OR STEEPING—"This is certainly the most critical, and one of the most interesting operations in preparing flax for the market; and the value of the lint, and the profit it yields, depends more upon the right way of watering it, than upon any thing else the grower of flax has to perform.

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* Pooler's Manual.

"The Dutch, and some others who grow flax, enjoy advantages with respect to watering it, that those who grow that species of crop in Scotland are deprived of. The numerous small canals, or fosses, by which the different farms or possessions are divided and subdivided, and which serve as fences to the different enclosures, are remarkably well adapted to the watering of flax; and it is to these fosses, more than to any other circumstance, that the superior quality of the Dutch flax is to be imputed. These ditch-canals or fences receive the rain-water from the surface of the land which they intersect, and being always open to the sun and weather, and so shallow that the water is warmed, and any injurious quality it contains drawn off, they are well adapted to the watering of flax. The mode of watering flax in Holland, and in the low-lying lands in Belgium and France, is to put a dam across the canal, clear out the weeds and mud for a few yards next the dam, lay in three or four rows of sheaves of flax next the dam, packing the sheaves close together, with the root-end towards the bottom of the canal, and the top-end leaning, the first course on the dam, and each succeeding row on the one before it; and then covering these about six inches deep with the rank herbage that grows in the canal, and the mud raked up from its bottom. A few more courses of sheaves are next placed in the same way, with weeds and mud, and in this way they pack in more flax, and cover it till the whole is put in steep.

"These fosses, and the mode of placing the flax in them, are as they ought to be; but the propriety of dragging up so much mud or slime from the bottom of the canals, to cover the sheaves six inches deep, may well be doubted. That mud will, no doubt, cover the flax from the rays of the sun, which is proper to be done, and it will keep the lint from floating; but so much mud laid over the sheaves, and that raised in the canal by raking it up to be laid over the flax, cannot fail to besmear the lint so much, and render it so nasty, that it would require to be much rinsed and washed in the water to remove the mud. This not only creates much labour, by no means the most agreeable, but it must greatly injure the lint by ruffling it in the water, a thing that ought to be avoided. When flax is handled roughly while it is soft and wet, even before it is put into steep, the rind, or lint, is readily injured; and it must be still worse when it is handled at the time it is taken from the pond. And if mud is not washed off the lint before it is dried, it must hurt its colour, and render it musty when scutching, and even when it is heckled and spun. With due deference to the sagacious and industrious Dutchmen, I would recommend to them, and to all growers of flax, to steep it in water that is as free as possible from mud or filth, so that the lint may neither be rendered foul nor have to be rinsed in water to the injury of the flax. It is proper to cover the flax when in steep, but that ought to be done with something not so nasty as mud. The reeds, bulrushes, and other coarse herbage to be found on the verges of all their canals, ought to be used in covering the flax when in steep rather than mud. In other respects I was much pleased with the mode of watering flax which I found practised on the continent.

"In Scotland the watering of flax is often performed in a careless and improper manner, partly owing to the difficulty of procuring proper water, and partly from want of proper attention in conducting that process. It is generally steeped in rivers, brooks, or small streams, that can be come at with least labour or expense; or in trenches that are supplied by such streams, without due inquiry being made as to the quality of the water. Some farmers put their flax in steep in any pond they can find, frequently in some place from which minerals have been dug, and where the water is strongly impregnated with mineral qualities, and without inquiring whether the water is hard or soft. Inattention to the quality of the water has often been found to injure the lint to a considerable extent. The qualities of the water ought to be well ascertained before flax is put into it, and particularly in Scotland, where minerals and mineral-waters so much abound—where few streams are altogether free of hard water or mineral qualities, that impede the watering of the flax, render it harsh, or give it a bad colour. Every farmer, or other grower of flax, should form a pond or trench of proper dimensions for watering the flax he raises, and take care that it be filled with water that is soft and free of every mineral tinge that can in the least injure the lint or retard its watering. Having found such water, the trench should be dug in clay or other retentive soil, or if otherwise, the bottom and sides of the pond or trench, should be coated with earth that it may retain the water. The trench should (if local circumstances permit) be from eight to ten feet wide, that a person on each side may put in and take out the sheaves with ease, and lay them on the bank, and it must be at least three feet and six inches deep, and longer or shorter as required. Some have made their ponds much deeper, but where that is done, the sun and air will not so readily neutralize the qualities that render the water hard, and when the flax is in steep, that at the bottom will not be so much acted upon as that which is uppermost, and of course one-half will be sufficiently watered before the other. The notion of keeping the flax afloat in the pond is a mere fancy. If mud or other impurities have got into the pond, they should carefully be removed, and pure water let into the trench some weeks before the flax is put into steep, that the sun and air may freely act upon the water, and render it soft; and on that account, the pond should not be shaded with trees. If possible a small supply of water should be kept ready to be let into the pond when the flax is in steep, not to change the water, but to supply exhaustion.

" When flax is put in steep, the sheaves, of the girth that a man can grasp in both hands, and bound not too tightly, should be set on end, the roots to the bottom, and the tops uppermost, leaning a little forward. Some reverse the sheaves, from a mistaken notion that the root ends are most difficult to water; but on due attention, it will be found that the root end, where the stem is hollow, is always easier to water than the top of the flax; and therefore the latter should be placed uppermost, where the sun has greatest influence. When the flax has been packed into the water, it ought to be slightly covered over with wheat-straw, fern, rushes, or coarse herbage cut from ditches or plantations, merely to prevent the light of the sun from injuring and discolouring the flax. Some stones or timber must be laid over the flax to keep it under water, for it is much disposed to float when the fermentation is strong, about the third or fourth day after it is placed in the water.

" If in sorting the flax, different dimensions or qualities are found, each of these ought to be kept by themselves in the water, and each of them watched and treated as they respectively require. If it shall be necessary to steep twice or oftener in the same pond, the water ought to be completely changed, otherwise the juices of the first parcel will retard the watering of that put in afterwards, and will give it a bad colour. No exact space of time can be fixed for the flax being drawn from the pond, as the heat or coldness of the weather, the softness or hardness of the water, and the quality of the flax have powerful effects in expediting or retarding the period for watering.

" An intelligent Dutch boor informed me, that he had found flax sufficiently watered in five days, and he had seen it ten days in steep without being injured. 'But when the bubbles of air disappear from the surface of the water, and the flax seems to have settled on the bottom, it may then be concluded that the operation of watering is nearly finished.'

"To avoid mistakes, however, on that important point, a few stalks ought to be drawn from the heart of a few sheaves, at different parts of the pond, and these carefully examined. Some of the stalks may be broken at about four inches distance; and if the heart of the stem can be easily drawn out of the bark or lint, then it is time to remove the flax from the pond. But if the lint still adheres to the boon or pith, it must be continued in the steep, till they are found to part freely. A small quantity of the flax may easily be dried, and beaten, and broken, to ascertain if it is ready to be taken out of steep. Great care on this critical point is necessary, as a single day, or even a few hours too long in steep, may render the lint soft, weak, and brittle; and if it is not properly watered, the lint is coarse, and cannot be separated from the boon. When properly watered, the stones or other covering is removed, and the flax taken up, and laid on the bank of the trench, with the ends of the sheaves a little elevated, that the water may run off before the flax is removed to the field to dry.

"In Holland and Belgium the flax is spread out on nearly as much ground as that on which it grew. This is called '*grassing*,' and when any of the boors have much flax, they have to pay considerable sums for grass land to spread their flax upon till it dry; and it must be an advantage to get such land near to where the flax is steeped, as the carting it far is not only expensive, but must injure the lint when it is much turned over and handled at the time it is wet and soft.

"The lint boors consider it fortunate when the flax gets a heavy shower of rain, soon after having been spread on the grass, and before it is dry, as the rain cleans the lint, and improves its colour; and whenever the flax gets dry after a shower, it is taken up and bound in sheaves as before, and after standing a few days in ricks, that it may be completely dried, it is stored in barns, on the joisting of the farm-houses, or in stacks, till it is beaten and scutched. The lint-merchants complain that the boors are too fond of bleaching their flax on the ground, in order to give it a fair colour, but which the merchants say weakens the texture of the lint.

"The same method of drying flax, after it has been watered, is practised by some lint-growers in Britain; but by far the greatest number of them in Scotland set the sheaves up on end, which in the language of the country is called '*gaiting*.' After the flax has been a few hours on the bank of the pond, to let the water run off and stiffen the sheaves, the bands are drawn up towards the tops of the sheaves, and each sheaf is set up by itself, the root end on the ground, and well spread out, to make it stand and admit air to dry the flax. After the sheaves have stood two, or not more than three days, and dried on the outside, the sheaves are turned inside out, the flax loosened so as to let in the air, and being again bound softly, they are set up as before, the root end being spread out in a circular form to make them stand; and they remain in that way till the flax is dry. They are next put up in small hand-ricks for a few days, and afterwards put up in stacks and well covered.

"Both these methods of drying flax have their advantages and disadvantages. By spreading the flax it is speedily and regularly dried, the rain cleans it a little, and it can be taken up equally dried and partly bleached. But the expense of grass-land, the carting to it, and the labour of spreading and turning the lint as some of them do, is much greater than when the flax is gaited. When gaited, the flax may be all set up within a few yards of the pond; the hire paid for grass-land and carting is in a great measure saved, and the flax is not so much rubbed and hurt. But when set up in sheaves the lint is not so well cleaned or bleached by the rain as when it is spread, and the inside of the sheaf, if the flax happens to be rather much watered, is not so soon dried as when spread.

"It has been proposed by some, that when flax happens to be too soon drawn from the steep, the defect may be remedied by allowing the lint to lie a day or two in a heap on the side of the pond, before it is spread or gaited; and it has also been proposed to remedy the evil, by allowing the flax to lie spread on the field till it is watered. These are probably the best means of correcting that mistake in watering imperfectly. But great care ought to be taken to avoid the necessity of having recourse to them. For when flax is laid in heaps at the time it is taken out of steep, the outside of the heap and both ends of the sheaves derive no benefit from lying in that state; and if insufficiently watered, the top end of the sheaves, which are worst to water, would derive no improvement by lying in a heap; and if the weather happens to be hot, the whole heap would soon heat so as to injure the lint. If the evil is attempted to be remedied, by allowing the flax to lie spread on the ground, it would soon be hurt by rotting, and the herbage growing up through it. The merchants in Holland consider all flax of inferior value that has been exposed to the weather more than a very few days. The defect of imperfect watering can only be brought on by inattention; for it is as easy to ascertain before the flax is drawn from the steep if it were watered, as it can be after it has been laid on the side of the pond on which it has been spread. And as these remedies are at best but partial, and injurious to flax, it should be carefully watered before it is drawn from the steep.

Bruising and Scutching Flax—"These operations are performed so very differently in Holland and in Scotland that the *modus operandi* in both countries requires to be detailed, and a few remarks made on each.

"In Holland and Flanders the flax, when dried after steeping, is generally stored in barns or in stacks that are well thatched, or on the joisting of houses over the cattle, till it be convenient to bruise and scutch it. If the flax has been stored in any dry place, it is sometimes bruised and scutched without any previous preparation; but generally it is slightly heated and dried on kilns or drying-houses built for that purpose before it is bruised. These kilns or drying-houses are about fifteen feet long, and are built of brick, having a place for fuel about two feet and a-half under the surface of the ground, so contrived as to send a gentle heat through the kiln, and yet to keep the fire from reaching the flax. The only fuel used is the refuse of flax, what in Scotland is termed '*shoes*,' by which the flax is heated and well dried before it is bruised; and one parcel after another is so dried as needed.

"This seems to me to be a very necessary preparation that is neglected in Scotland, to the injury of the flax, and loss to the owner. When flax is stacked in the open air in this damp climate, it cannot be so dry, or the boon or woody part of the stems break so well, or part so readily from the bark or lint, as when the stems, already rendered brittle by the watering, are well dried before being bruised.

"Moderate drying of the flax seems to have a similar effect with drying of grain before it is ground into meal. This might be easily done in Scotland on the corn-kilns, and the neglect of it certainly is injurious to the flax.

"In Holland and Flanders, the operations of bruising and scutching the flax are both executed by hand-labour; but these are done by machinery in Scotland. The bruising apparatus on the continent is very simple, and wrought by the hand. Four thin boards, about fifteen inches in length and three inches broad, are fixed horizontally, with their edges uppermost, at about three inches distance from each other, and about thirty inches above the ground; and three similar boards of timber, of the same dimensions every way, are fixed to the other on a hinge at the one end, so as they can be raised and sunk at pleasure, and each of the three falls in between two of the four under-boards. The upper or moving half being raised, and a handful of the dry flax laid right across the four under-boards, the three upper ones are forced down on the flax, and one of the three going in between each of the four boards, the flax is broken and crushed, and the operation repeated, and the flax turned over and over; the whole boon or woody part of the stems is broken and bruised, so as to be well prepared for being scutched with good effect. That handful is then twisted and laid aside, and another taken up to undergo a similar operation.

"In Scotland, the bruising of flax was long performed with a hand-mallet, upon a smooth stone, and the flax bent and rubbed a little, to break the boon or woody stems, so as it might be separated from the flax by scutching. But when machinery came more into use, beaters were removed by the wheels of flax-mills; and soon after indented rollers were formed, to crush and break the flax still more completely. One roller, three feet diameter moves in the centre, and two other rollers, each of fourteen inches diameter, operate on the large one. All the three are indented at least two inches and a-half deep; so that when they are moved round, each of the concaves falls into the convex of the other roller, and the flax being spread thin and the top end of it let in between the rollers, is carried round with them, and completely crushed and broken in going once round the large roller in the centre, which throws off the flax ready for the scutching.

"Having paid attention to both modes of bruising, and seen them in operation, I am decidedly of opinion that the Scottish mode is much preferable to the Dutch, in performing the work far faster and much better than that used on the continent; not forgetting, however, that the Dutch mode of drying the flax before bruising is a great improvement. In Holland, Belgium, and such parts of the north of France as I traversed, flax is not scutched and cleaned in mills, or any species of machinery, but entirely by hand-labour. The whole process is of the most simple nature. The scutcher sits on a block of timber, about eighteen inches high, and having a board at his right hand, about the height of the arm of a chair, with a nitch or excavation that a man's wrist would fill up, he takes up a handful of bruised flax, twists the top end, and holding it in his left hand he throws the root end over the nitch in the board, and with a thin piece of timber, about the size of a soup-plate, with a short handle, he scutches the flax, turning it over and over with his left hand, till the one end is clean, and then he twists it, and operates on the top end, till it also is cleaned, and by repeated changings and scutchings, he makes the flax fit for market. This appears to me to be a soft and easy operation for the flax, compared with what it is subjected to in a Scottish lint-mill to which I shall now advert. In Scotland, and I believe in England and Ireland, flax is scutched by machinery. A water-wheel turns an upright shaft or spindle, on which four arms are fixed, each of them about seven feet ten inches long, and having wipers on each end; they are moved round horizontally, at the rate of two hundred times per minute; and as the flax is held in at holes or slits in the upper side of the box or frame, within which the arms move, each of them, or the wipers fixed on them, give the lint a scutch every time they go round, or at the rate of 800 strokes per minute. The flax is thus exposed to a most severe beating, by which no small portion of it is broken down and lost."*

"The practice of breaking flax by the common machinery in the country mills we think extremely injudicious, especially when we consider the manner in which it is universally performed. The machinery, generally driven by water power, is made to revolve much too rapidly; thereby not only injuring and wasting the flax, but in every case presenting a very serious degree of danger to the operator. The common hand-break is much preferable; and although it takes a little more time, the farmer will gain considerably by its adoption. He can, by this instrument, reduce the flax to any degree of softness he may wish, and without the least waste; and moreover it will afford the most suitable occupation for cold and bad weather.

"The present method of scutching flax in Ireland is the most injudicious and unwise that could possibly be thought of. It appears to be the principal object of the general run of scutchers to reckon the work they do by quantity only, without any regard whatever to the quality of the article which they may produce. The rapidity with which the machinery is made to move is extremely injurious to the flax; and in conjunction with this, the general ignorance and carelessness of workmen are productive of a waste of very serious amount. The most perfect manner in which the work could be performed is by hand, as is the general practice in Holland. The only objection to this method is the length of time it would take up, and the consequent additional expense which would be incurred. We think, however, that if a trial was made on a properly prepared sample, the additional expense would be found to be altogether, if not more than compensated by the superior quality of the article which would be produced. As soon as the flax is cleansed, it should be kept in a close place, free from air, and rather a little damp than otherwise. The oil so necessary for the produce of yarn of a fine quality will thus be kept from evaporating; and that kindly softness, which always accompanies a good article, will be preserved for an indefinite length of time."†

FORGE.—Considering the great dangers which they incur, and the loss which may be sustained from their unskilfulness or inattention, no class of operatives is worse paid than that of the common shoeing smith. If the horse-shoer blunders, he may lame a horse for months, and cannot remedy the effects of his momentary awkwardness; and yet the most careful and expert smith, for the most correct treatment, receives no higher rate of payment than the blacksmith who works in security—he has no extra allowance for his chances of being kicked to death by a colt unaccustomed to the operation of shoeing, or by a veteran and vicious animal, impatient of the necessary restraint and posture during the process of shoeing.

It is really a very serious matter to undertake, according to ordinary practice, the driving of nails into the hinder hoofs of an animal which in a moment may beat out the brains of the operator.

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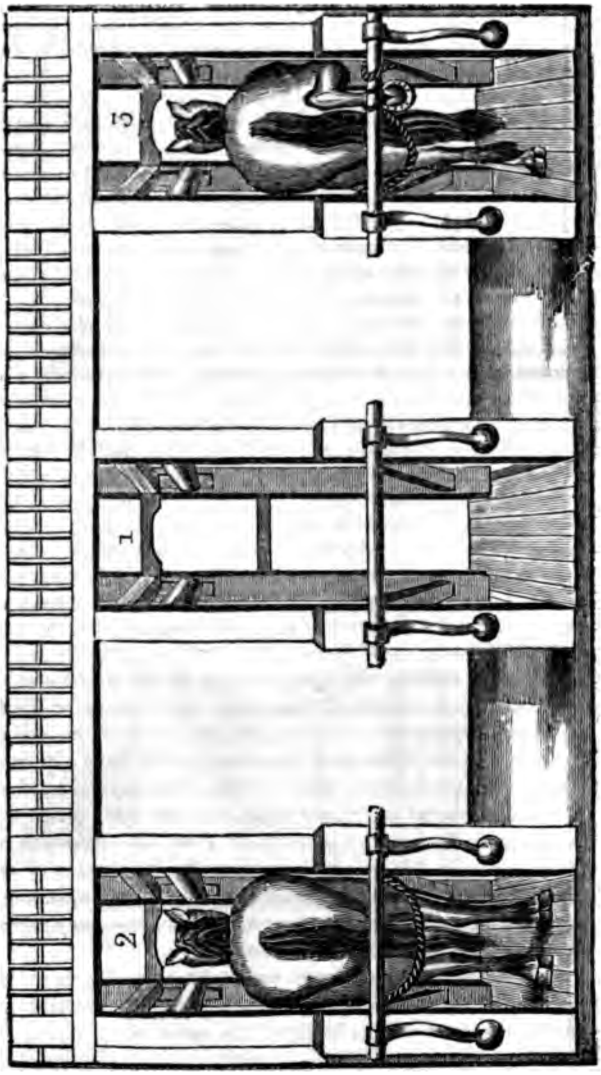
* Mr. Aiton on the Cultivation of Flax in Holland and in Scotland. Quarterly Journal of Agriculture.

† The Irish Farmer's and Gardener's Magazine.

Mr. Radcliffe, in his report of the agriculture of Flanders,* has given the annexed scale and plan of the forges used in Flanders for shoeing horses.



No. I.—Front View.

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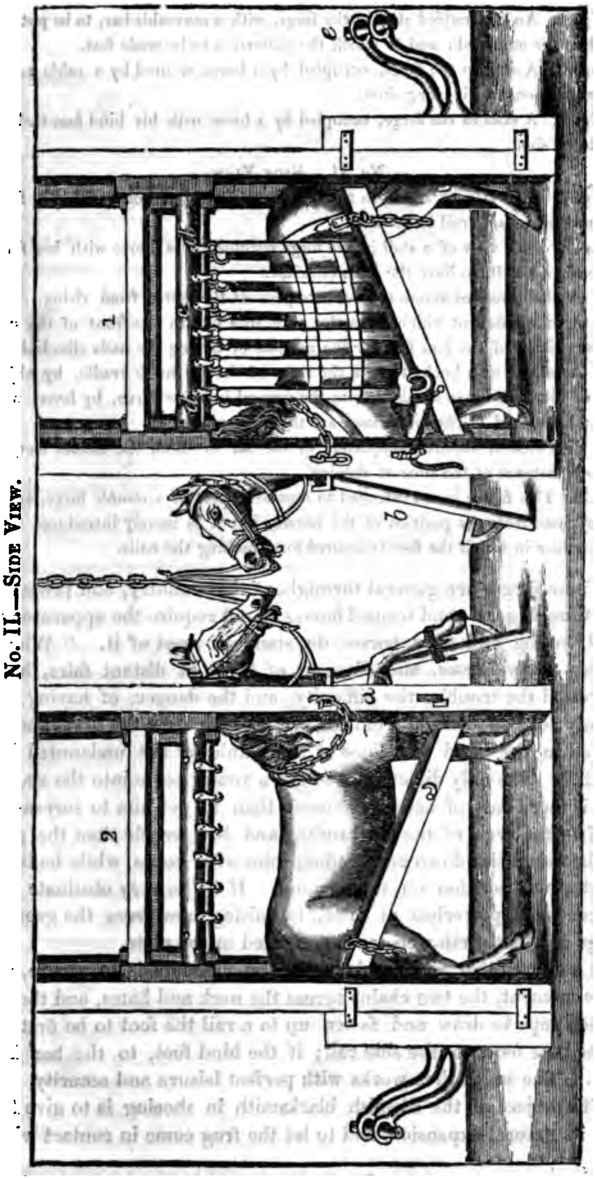
* A new and cheap edition of this work would be useful and interesting.



No. II.—Side View.

No. I.—Front View.

Fig. 1. An unoccupied stall in the forge, with a moveable bar, to be put in after the horse is admitted; and to which the pastern is to be made fast.

Fig. 2. A stall in the forge, occupied by a horse secured by a cable across his hams, previous to his being shod.

Fig. 3. A stall in the forge, occupied by a horse with his hind foot tied to the bar to be shod.

No. II.—Side View.

Fig. 1. Side view of a stall in the forge occupied by a horse with his fore foot fastened to the side rail to be shod.

Fig. 2. Side view of a stall in the forge occupied by a horse with his fore foot fastened to a stilt, to have the nails clinched.

a, A chain hooked across the neck to prevent the horse from rising.

b, A moveable stilt which runs along an iron bar in the front of the stall, to support either of the fore feet for the purpose of having the nails clinched.

c, A roller, with hooks to take the rings of the girthweb cradle, by which, in case of vice, the horse is raised from the ground in a few turns, by lever, working in the holes *d*, *d*. The levers used are the forge pokers.

e, Side view of the iron supporters of the bar to which the hinder foot of the horse is fastened at the time of shoeing.

N.B. This figure is not intended to represent part of a *double* forge, as might be supposed from the position of the horses, but it is merely introduced to show the manner in which the foot is secured for clinching the nails.

These forges are general throughout that country, and properly so, for, though gentle and trained horses do not require the apparatus there used, young and fiery horses do stand in need of it. "Who that breeds many horses, and disposes of them at distant fairs, has not regretted the trouble, the difficulty, and the danger, of having ten or twenty colts shod, wild from the pastures, and for the first time committed to the hand and knee of some unlucky but undaunted blacksmith." The only difficulty is to get a young horse into the stall; but this is more easy of accomplishment than to get him to surrender his hoof to the arms of the blacksmith, and less terrific than the process of throwing him down and binding him with ropes while he lies in a constrained position on the ground. If he be very obstinate he can be rendered powerless at once, by raising him from the ground by slings of stout girth-web, as represented in the plate.

It appears that the usual practice in Flanders is to secure, at the same moment, the two chains across the neck and hams, and then by a noosed rope to draw and fasten up to a rail the foot to be first shod; if the fore foot, to the side rail; if the hind foot, to the bar in the rere. The smith then works with perfect leisure and security.

The object of the Flemish blacksmith in shoeing is to give to the heel its natural expansion, and to let the frog come in contact with the ground. He never turns or cocks the heels, (except in front,) or distorts the natural position of the foot, which should rest with evenness on the ground.

FROST.—That state of the atmosphere which causes water to congeal. Every farmer knows that frost in winter is serviceable to the soil, and that a failure of crops frequently takes place after a winter of extreme mildness; but he does not understand the principle on which the congelation of the soil contributes to its subsequent fertility. The principle is this,—in the process of congelation, the water, as it freezes, expands, and, therefore, necessarily separates the particles of earth in which it is held; frost thus operates better than any instrument of human construction, for its action reaches to the minutest particles, and thus renders them friable. In dry earth it has little or no effect in this way, (but is beneficial by destroying grubs and insects,) and on sand it makes no impression. On ploughed clay-land, frost then has the most efficacious effect. The depth to which frost penetrates in some of the extreme northern countries is surprisingly great, but in our islands it is seldom of sufficient duration or intenseness to affect the soil to a depth of more than a few inches. The vapours arising from the seas around us, and constantly combining with the land air, prevent the long continuance of frost, and from their uncertain motion at the same time render its continuance equally unsettled. The power of frost on vegetables is well known. Trees are sometimes destroyed by it as if by fire, and split with a noise resembling the explosion of artillery. In winter, however, trees generally have neither leaves nor flowers, and their buds are so hard as to withstand the effects of congelation, but hard frosts late in spring are often very injurious, as the buds are then appearing. *Moisture* is the principal agent of the injury which frost occasions to vegetables, and, therefore, every thing which tends to dry them previously, even a sharp north wind, will, by removing the humidity, tend to their preservation. In late autumnal frost the effect of evaporation by the heat of the sun, is often exemplified on the stems of potatoes. If a hoar frost—dew turned into ice by the coldness of the air—be immediately succeeded by the influence of the sun, the dew liquifies, and by the process of evaporation *the stalks lose their vitality*. If the frost be brushed off, (and this can be easily done by two men moving along the beds or drills with a rope between them, very early in the morning before the evaporation takes place,) the stalks will sustain no injury. The same principle applies of course to other plants under similar circumstances. It is during the progress of evaporation that the death of the plant takes place; and it would appear that the destructive power of evaporation is proportioned to the degree of *humidity* in the body on which it acts. It is but fair to remark, that Professor Rennie has broached a doctrine as opposite to this, and we think as contrary to experience as can be imagined. In the "Alphabet of Gardening," the following passage occurs:—

> "Very erroneous notions, it would appear, are commonly held respecting the action of frost upon soils. Even scientific men have concluded that frost, by crystallising the water retained in clay soils, tends to loosen it by separating the particles; all which seems very plausible, but plain facts and experience demolish the theory; instead of being expanded, and the particles separated from the swelling of the ice, accordingly, it is found, that wet clay squeezes out the water to the surface, while the particles of the clay become more tenacious, solid, and close.
>
> "It will hence be injudicious to rough-dig a stiff or watery clay soil with the view of mellowing it by frost, and still more to expose clay intended for composts to freezing."

FUNGI—An order of parasitical plants of the mushroom tribe, forming a link between the animal and vegetable kingdom. They belong, however, to the latter, and are perfectly organized, though with exquisite minuteness. The manner of their production is in truth unknown. Being the most perishable of plants, they are the most favourable for the production of insects which may be seen through a microscope. These fasten upon the leaves and stalks of plants, and rob them of their nourishment, and occasion blight, rust, mildew, and similar diseases.

The ancients called fungi "children of the earth;" moderns have been undecided whether to class them in the animal or vegetable kingdom. They are in fact a connecting link between both. These parasitical plants are well known to us in the form and substance of mushrooms and fairy-caps, and are too frequently apparent in the nature and substance of red-rust, blight, and mildew. When the atmosphere is loaded with warm moisture in spring, they sometimes spring into existence as in a moment—"children of the mist," if not "children of the earth"—and rapidly extend themselves over the stems and leaves of corn-plants, and, true to their parasitical quality, adhere to them until they deprive them of every source of vigour and vitality. The extreme rapidity of their growth gives presumptive evidence of their great powers of absorption, which causes them to be fit and attractive receptacles of myriads of the eggs* of floating animalculæ, (so small as to be seen with difficulty by the microscope,) which are deposited on the tainted plants. The appearance of these animalculæ has given rise, therefore, to the erroneous opinion that the different modifications of fungi on corn, in the characters of blight, red-rust, mildew, &c. are *animal* in their nature. Fungi are produced, they live, they grow, by development; they are exposed to those vicissitudes natural to the different periods of life which characterise living substances; they perish and die. They extract, by the extremity of their vessels, the juices with which they are nourished; they elaborate and assimilate them to their own substance; they are, therefore, organized and living beings, and consequently belong to the *vegetable* kingdom. But whether they are real plants, or only the production of plants, is still a matter in dispute with the ablest naturalists.*

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* 100,000 of these are not equal to the fourth of a grain.

FURZE—Whins, or Gorse, (*Ulex Europæus.*) These, in many parts of Ireland and Scotland, supply faggots for the poor man's hearth and the baker's oven. When intended for this purpose, furze fences are allowed, from the time that the seed has been sown, to grow and straggle as nature directs for four years; at the end of this time they are cut down by a labourer, who saves himself from the prickles by an encasement of rough untanned leather upon his left leg, which in the operation of faggoting he presses firmly on the branch to be cut down, while with his left hand, similarly guarded to the elbow, he holds the portion which he is about to cut down with his uplifted right hand; he then ties the amputated bushes into small bundles with a suitable band of the same materials. If preserved from injury, the stumps soon throw out fresh shoots, and at the end of every three years afterwards the cutting is renewed. With common care, furze fences last for a very long period, (see *Fences.*) But the young shoots of whins—the *French furze* especially—are of great importance as food for cows and horses in winter and spring, until *the blossom appears*, and it is desirable that in the poor light dry soils, where whins grow best, their *value* in this way should be fully appreciated. A gentleman near Birmingham has devoted an hundred acres to French furze, (the seed of which can be easily procured,) which are regularly mown with a scythe for a corresponding number of milch cows, and bruised in a mill; mixed with chopped straw or hay, this constitutes the entire food of his cows. Bruised furze are also excellent for horses, as a substitute for hay. Nothing tends more to make them sleek and fat; but oats or beans should be given with them, to counteract their relaxing properties.

The small-holder bruises them for his solitary cow, or pair of horses, in a trough, with a wooden pounder, furnished at the lower end with a sharp piece of iron. The farmer on a large scale should have a mill worked by horses, or by water-power.

Mr. Cliffe of Bellevue, near Wexford, a very estimable land proprietor of that county, uses whins in considerable quantities, and has taken much pains to render perfect, the construction of a mill which he has erected on his farm department.

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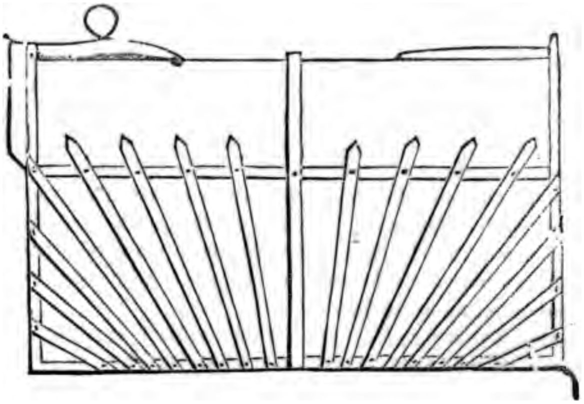
* Encyclopædia Britannica.

The best way of raising the plants is by sowing the seed in beds very thickly, and with the care bestowed on cabbage-seed. In the ensuing year they are fit for setting out, wherever they are required.

GATES.—When the material does not exceed seven shillings per cwt. iron gates, considering their durability, are the cheapest and best, if they be sufficiently strong; if slight, they are easily bent and put out of order. Gates of five bars, whatever be the material, are enough for any ordinary field purposes; these bars should be connected by a diagonal bar from the top of the higher upright to the bottom of the other. We recommend the reader to see a model in Low's Elements. The posts may be of timber well sunk in the ground; blocks of granite, square or round; or pillars built with lime and mortar.

On account of the difficulty of hanging very wide single gates with precision, double gates, on distinct hinges, to meet at the middle bars, and to fasten there by a latch, are cheap and convenient; they should be lighter towards the posts than the centre, to prevent them from losing their balance and inclining from the posts to the middle. In the Irish Farmer's Magazine, Vol. I. appeared the subjoined sketch of an iron gate used on the farm of Mr. Adair, near Monasterevan. It has nothing on the score of *beauty* to recommend it.



GEESE.—(See *Poultry.*)

GOATS.—No one presuming to call himself a farmer, or possessing shrubs and plantations, would think of keeping these animals, unless confined in a yard as pets for children, who ought early to acquire habits of tenderness and care for every docile and domestic animal; but to the poor mountaineer, in his wild and lonely solitudes, they are a source of profit and comfort. Where there are no young trees to be injured, they may browze at large on the mountain brakes without expense; and in winter, when housed, they are easily supported on whins, the refuse of cabbage, the peelings of potatoes, and such worthless food. To those who cannot afford a cow, the goat is a real treasure when yielding milk, which she will give for several months, at the average of two quarts per day. Goat's cheese also is a wholesome and pleasant food. The female bears for six or seven years; the male should not be kept longer than five. A goat not two years old, perfectly fat, is excellent meat, and a fat kid is delicious. The hair makes good lindsey. It is surprising that goats are not much more numerous in mountain districts, where they may be maintained absolutely without expense. It is grievous to see a female kid sold for a shilling by the necessitous poor, to whom her prolonged life might be really valuable.

GRASSES.—In sowing grass seeds, three points are to be especially considered, viz. the length of time during which the land is to be occupied by them; the purpose to which the grass land is to be applied; and the condition and quality of it. On ground intended for permanent pasture, it is obviously injudicious to sow short-lived grasses; in such case those perennials which are found to abound in the best old pastures should be selected. Where an *early* bite is required for ewes, and the land is to lie but a single year in pasture, trefoil, without any admixture, is excellent. Such grasses as suit the nature of the soil should in all cases be preferred.

A great deal of the successful establishment of grass seeds, whether permanently or not, depends on the clean and pulverized state of the land. If it be foul (as is so generally the case with the small holders in Ireland at the end of scourging courses of corn crops) there cannot be worse farming than the sowing of grass seeds on it. It should be first thoroughly cleaned by naked fallow, or such fallow crops, (turnips and potatoes,) carefully hoed, as will cleanse the soil and allow the free establishment of sown grass seeds without any intruders.

Where there is a natural tendency to indigenous pasture, grasses of good quality there will doubtless in the course of time appear—and so much the better—and will often of themselves form an excellent sward, after the sown grasses have disappeared, from incongeniality of soil, want of longevity, or the overpowering nature of the indigenous grasses. Instances are not very rare of good permanent pastures being established where annual grasses only have been sown; but it would be very injudicious to depend upon the bounty of unaided nature, except perhaps on peat soil, where, with sufficient care, fiorin-grass soon springs up to the exclusion of every other. Grass seeds are best sown in April, immediately after *barley* has been harrowed down; they should be covered with a very light seed-harrow, or a gate wattled with thorn bushes, and then rolled.

With *early* fallow wheat they may also be sown, with perfect certainty of success. The following mixtures of grass seed, calculated by Mr. Pooler for the Irish acre, and arranged from Lawson's tables, are excellent:—

" FOR LIGHT AND MEDIUM SOILS.

"*One Year's Hay.*—Perennial rye-grass, 30lbs.; red clover, 12lbs.; white clover, 3lbs. Total, 45lbs.

" *One Year's Hay, and One Year's Pasture.*—Perennial rye-grass, 30lbs.; red clover, 9½lbs.; white clover, 6½lbs.; non-such, or yellow trefoil, 3lbs. Total, 49lbs.

" *One Year's Hay, and Two Years' Pasture.*—Perennial rye-grass, 30lbs.; red clover, 5lbs.; perennial clover, or cow-grass, 5lbs.; white clover, 6½lbs.; non-such, 3lbs. Total, 49½lbs.

" FOR HEAVY SOILS.

" *One Year's Hay.*—Perennial rye-grass, 30lbs.; Timothy grass, or cat's-tail, 1½lbs.; red clover, 12½lbs.; white clover, 3lbs. Total, 47lbs.

" *One Year's Hay, and One Year's Pasture.*—Perennial rye-grass, 30lbs.; Timothy, 1½lbs.; red clover, 9½lbs.; white clover, 6½lbs.; non-such, 3lbs. Total, 50lbs.

" *One Year's Hay, and Two Year's Pasture.*—Perennial rye-grass, 30lbs.; Timothy, 1½lbs.; red clover, 4½lbs.; cow-grass, 4½lbs.; white clover, 6½lbs.; non-such, 3lbs. Total, 50lbs.

" Although *Italian Rye-grass*, when sown in too great a proportion, is, from its strong habit of growth, apt to choke or weaken the clovers, yet by substituting 5lbs. of it for 8lbs. of the *Perennial Rye-grass* in the above arrangement, the produce will be materially improved. In proportion to the retentiveness of heavy soils, the *Timothy* should be increased from ½lb. to 1½lb. additional, and in many cases for *one* or *two* years' pasture, the *rough cocks-foot*, the *rough-stalked meadow grass*, and some others, might be substituted for the *Perennial Rye-grass*, varying the kinds and quantities according to circumstances.

" FOR PERMANENT PASTURE.—LIGHT SOILS.

" *With a Crop.*—Meadow fox-tail, 1½lb.; yellow oat-grass, 1lb.; cocksfoot, 6½lbs.; hard fescue, 3lbs.; meadow fescue, 1½lb.; creeping fescue, 3lbs.; perennial rye-grass, 16lbs.; smooth-stalked meadow-grass, 1½lb.; yellow trefoil, 1½lb.; cow-grass, 5lbs.; white clover, 6½lbs. Total, 47lbs.

" *Without a Crop.*—Meadow fox-tail, 3lbs.; cocksfoot, 8lbs.; hard fescue, 3lbs.; various-leaved fescue, 1½lb.; meadow fescue, 5lbs.; perennial rye-grass, 19lbs.*; Timothy, 2lbs.; rough-stalked meadow-grass, 3lbs.; non-such, 1½lb.; cow-grass, 6½lbs.; white clover, 8lbs.; barley, or rye, 1 bushel. Total, 60½lbs.

"HEAVY SOILS.

"*With a Crop.*—Meadow fox-tail, 3lbs.; cocksfoot, 6½lbs.; hard fescue, 1½lb.; spiked fescue, 1½lb.; meadow fescue, 3lbs.; perennial rye-grass, 16lbs.; smooth-stalked meadow-grass, 3lbs.; rough-stalked meadow-grass, 3lbs.; non-such, 1¼lb.; cow-grass, 5lbs.; white clover, 6½lbs. Total, 42lbs.

"*Without a Crop.*—Meadow fox-tail, 3lbs.; cocksfoot, 8lbs.; hard fescue, 1½lbs.; various-leaved fescue, 1½lbs.; spiked fescue, 3lbs.; meadow fescue, 5lbs.; perennial rye-grass, 19lbs.; Timothy, 5lbs.; rough-stalked meadow-grass, 5lbs.; non-such, 1½lb.; cow-grass, 6½lbs.; white clover, 8lbs.; barley, or rye, 1 bushel. Total, 67lbs.

"To the above mixtures may be introduced with advantage, on dry and elevated sheep pastures, 3lbs. to 6lbs. *sheep's fescue;* on dry light lands, 1lb. of *yarrow;* and in all cases where a crop of hay is to be taken the first year, 2lbs. of *perennial,* 1½lbs. of *Italian rye-grass,* and 3lbs. of *red clover,* should be added.

"FOR HEATHY OR MOORY LANDS,

Which have been pared and burned, or otherwise improved, with a view to their producing better herbage.

"*With a Crop.*—Mixed hay-seeds, 39lbs.; white clover, 8lbs. Total, 47lbs. Or, mixed hay-seeds, 26lbs.; Italian rye-grass, 5lbs.; white clover, 8lbs. Total, 39lbs.

"*Without a Crop.*—Mixed hay-seeds, 49lbs.; white clover, 10lbs.; rye or barley, 1 bushel. Total, 59lbs. Or, mixed hay-seed, 33lbs.; Italian rye-grass, 6½lbs.; white clover, 10lbs.; rye or barley, 1 bushel. Total, 49½lbs.

"These lands will rarely afford any thing more than a very cheap mixture of seeds, and the above are found adapted for such. When lands of this description are of a damp nature, the following may be introduced as part of the hay-seeds:—*Timothy,* 21lbs. to 51lbs.; *rough-stalked meadow-grass,* 3lbs. to 5lbs.; *meadow soft-grass,* 1½lb. to 3lbs.; *fiorin-grass,* 1½lb. to 3lbs. If the lands are 500 feet and upwards above the level of the sea, and especially if the soil be dry and intended to be depastured with sheep, the following may be introduced as being naturally adapted for mountain pastures: *sheep's fescue,* 4lbs.; *zig-zag hair-grass,* 1½lb.; *hard fescue,* 3lbs.; *perennial red clover or cow-grass,* 3lbs."

For the first and second cases the biennial rye-grass would obviously answer equally well, or better, if the right sort be procured, as it grows rather taller than the perennial species.

All the kinds of rye-grass should be mown early, else they make harsh and dry hay; the plant also, if allowed to ripen fully, so impoverishes the ground as to afford very little after-grass.

Where soiling only is the object, we would increase the quantity of red clover seed by 3lbs. diminishing the rye-grass by 8lbs. or 10lbs. and leave out the white clover altogether. Where the grasses are for more than two years, the cow-grass (a perennial clover) is very properly substituted for the common red clover, which lasts only two years.

There cannot be worse economy than sowing foul seed of any kind, or stinting the quantity even of the best.

It is very common to sow the sweepings of the hayloft without due regard to the quality of the grasses and the quantity of weeds which have produced them, and the consequence is, that the ground, instead of being covered with a good thick sward, is overspread by plants unnatural to it and unfit for pasture.

Though we have given the best instructions as to the quantity of seed per acre, we would by no means be too sparing of it; for if there be abundance at hand, grass-seeds can hardly be sown too thick. The ground should be completely covered with plants, which shelter each other.

To have the surface entirely occupied, stones should be carefully taken off before rolling, and after the concluding harrowing, and weeds extirpated, if any should appear. Some prefer rolling before the sowing of the clover-seed, in order to have the surface perfectly even for its reception; and then a bush-harrow, or any light one with teeth, not exceeding three inches long, and six inches asunder, covers the seed effectually, the driver walking behind the horse with a rope in his hand, fixed to the back of the harrow to prevent it from trailing and displacing the seed. Great loss is sustained from the use of seeds which have not fully ripened, or which have fermented; clover-seed especially is often almost worthless from mismanagement in the saving.

It is no uncommon thing to kiln-dry it so much as to render it useless; but a person of any judgment will readily perceive the bad condition of it; if it is not plump and of a purple colour, it should be rejected; if hurt in the drying it will be red, and crisp to the taste; and if unripe it will be of a faint colour.

The Guinea grass, a species of *holcus*, first introduced to the West Indies from Africa, has been recently cultivated with success in Western Australia. From the reports of our colonists there, there is every reason to conclude that it would be a useful addition to our domestic grasses, on sandy or rocky soils, unproductive of finer and more succulent herbage.

The history of its first appearance in Jamaica is as follows:—Mr. John Ellis obtained some birds there from the coast of Guinea, and with them a supply of seeds for their support. The birds died, and the seeds were thrown away. From these, however, sprung some grasses, which were transplanted into a garden, and gradually cultivated, until this plant became a general favourite. It is suited to almost every soil and situation, and affords sustenance where other herbage will not succeed.

In wet weather it may be cut in warm climates every fortnight, and if allowed to attain maturity, it grows to the height of from five to eight feet. It resists the parching influence of dry and hot weather in a remarkable manner. The mode of its culture, as represented in the Perth Gazette, is singular. Holes are dug from three to five feet apart, and large and deep enough to bury a few roots of it, taken from a neighbouring grass-piece. The separation of the large roots is considered serviceable to the remaining plants, which are carefully closed and moulded again, and the abstracted plants are topped within a few inches of the roots, and pressed firmly with the foot when they are put down. The surface around is kept clear and loose with the hoe, at the time of the falling of the seed, which covers all the intervals around, and which receives no other covering or care than what is afforded by the treading of the cattle depasturing the plants.

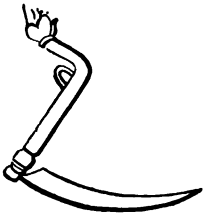
In rich and new land the stalks become so strong as to annoy the cattle by hurting their nostrils, and this prevents any close cropping, in consequence of which the refuse herbage must be either mown or burnt.

The Guinea grass establishes itself in a short time, and continues luxuriant for several years. If it becomes partially thin, new holes are dug, and fresh plants introduced. This mode is, in principle and in practice, identical with that of cultivating grasses by *inoculation*—a practice recommended some years ago in this country, but not adopted by many.

Treatment of Grass Lands.—Weeds and coarse plants are too often allowed to appear among the cultivated grasses, even where these are intended to have permanent occupation. Ferns, thistles, docks, ragweed, &c. are allowed to grow and take possession until they scatter their seed, or spread their roots through the land. These should be carefully taken out, not only from the fields but even from the hedgerows and ditches, wherever they appear, with a weeding-hook, or narrow, spade-like implement, and carried to the dung-pit, and have their places filled with choice grass seeds. Most of the varieties of the thistle are annual or biennial; the common field and sow-thistle are perennial. The former is destroyed by constant close cutting, and the others are seldom found on grass lands. Rushes are only eradicated by under-draining, and manuring with lime or other calcareous matter; on dry or well-drained land they are never seen. Irrigation, well managed, has also the effect of destroying coarse weeds. Ragweed is soon destroyed on pastures grazed by sheep, which eat down the young plants to the very hearts as soon as they appear.

Grass lands should never be poached by cattle in wet weather, and it is ruinous to young grasses to have any cattle upon them. See *Pasture*.

HAINAULT SCYTHE.—We give the representation and description of this, because it is well worthy of almost general adoption, and ought to supersede, in many cases, altogether the instruments which we use for severing corn.



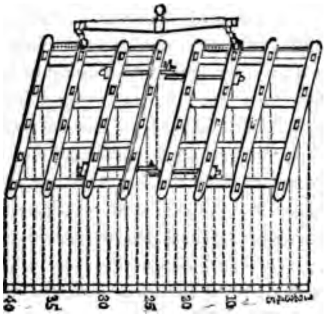
"This is a better implement than our cradle scythe for mowing corn; the handle is but fourteen inches, with a shield for the hand of four inches and a-half; in all, eighteen inches and a-half; the blade is two feet three inches in length; the point being a little raised, and the entire edge bevelled upwards, so as to avoid the surface of the ground; by these means the whetting stone is not so frequently required; and the handle of the crook, carried in the left hand, being of hard wood, is used as a scythe-board. In three or four strokes (according to the thickness of the crop) a sufficiency for a sheaf is cut, all the heads are kept in a line by means of the crook, the back of which is always pressed against the standing corn in the direction of the wind, before the stroke is drawn, and the severed corn is regularly closed up with the scythe and foot, ready for binding, and precisely where it ought to lie.

"Now, in Flanders, manual labour is never spared, there must, therefore, as Mr. Radcliff observes, be some other recommendation besides economy; nor can the farmer's eye be at a moment's loss to discover the merit of the practice, which appears in the extreme neatness and regularity of the work, the additional length of the straw, and the almost total disappearance of stubble, so necessary to the cleanliness of the future ploughings, which commence *as soon as the corn is removed.* In point of expedition, also, without considering its economy, the use of this implement is considered of great importance in Flanders, where it is a maxim in farming, *that the different works shall not be suffered to encroach one upon the other,* and where for safe and quick harvesting, the presence of fine weather must be used to the greatest advantage. But in many places where labourers are few, and of course engaged at a high rate, the saving effected becomes an object, being at the lowest calculation a saving of one half beyond the sickle."

See *Sickle.*

HARROWING.—This operation is very important in loosening, pulverizing, and mixing the different particles of earth, and in cleansing the ground from weeds. When rough land is undergoing the process of harrowing, the driver, who ought to walk behind the harrows, guiding the cattle with long reins, and with a short rope in his hand, fastened to the hinder part of the harrow in order to disengage it from any stones or clods which would trail the seed, or prevent the free operation of the pins, should make his cattle walk briskly, as the force with which the harrows act on the clods depends on the velocity with which they are moved, as well as upon their weight. Harrowing should never be executed (except under the pressing circumstance of covering seeds which may have been sown previously to sudden rain) while the land is wet, as the treading of the cattle is highly injurious, and the earth in such case does not separate freely.

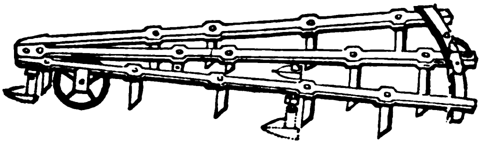
HARROWS.—These are of various sizes and strength, from the heavy single or double brakes, for two or four horses, to the light seed-sowing harrows.



The above plate represents the improved Scotch harrow, which can be separated for single horses if necessary; the tracks in which the pins move are at equal distances, and each pin describes its distinct course, so that every particle of the surface is stirred. This description of harrow can be constructed of light or heavy materials, according to the nature of the soil, and the purposes for which it is designed. If for tenacious land, more strength is required, and in such case there should be diagonal bars of iron to give support to the bulls. Iron rods are inserted in two of the bulls of each harrow, having hasps and hooks, by which the harrows are united. These double harrows should be wide enough to cover a breadth of nine feet.

The triangular harrow, for one horse, is a most useful implement for levelling and pulverizing the intervals between the drills of potatoes, turnips, &c. &c. Pins, hoes, or coulters, can be inserted into the bulls. This harrow can be widened or contracted by the iron bars, at the broad end, which lap over each other and are fastened by a pin and screw.

THE TRIANGULAR HARROW.



Three or four light harrows are sometimes combined, for covering seeds on very wide ridges, or a flat surface; these are drawn from a long bar to which they are all attached.

Iron harrows are now very common. These, from their durability, as well as the slenderness of their frames, (presenting less obstacle to movement,) are the best.

Gray's seed-harrow, for wet seasons, is to wheat-growers on an extensive scale, a very useful implement. Wheat is often sown when from unexpected rains the state of the land renders it injurious for cattle to walk over the sown ground. This harrow is drawn by two horses, each walking in a furrow, and yoked in shafts (which are moveable to right and left) attached to the extreme ends of the harrow, so that it does not follow in their tracks, but works in the space intervening between them; a common car-wheel is also applied at each extreme end; the plan of this seed-harrow is to be seen in Loudon's Encyclopædia of Agriculture, where there is also to be found the model of an angular-sided hinged-harrow, which is stated to be "one of the best implements of the kind, and less liable to be deranged in turning than the common harrow."

HARVESTING CORN.—

"The usual practice in England is to cut down all corn before it is quite ripe, and to leave it in stook; or in the case of barley, on the ledge, until the grain is perfectly matured and hardened; and the same practice prevails in Scotland, where the variations of weather are as rapid and as frequent as in Ireland. Experience, however, has occasioned a remarkable distinction in the mode of harvesting barley in the two portions of Great Britain just mentioned. In England, barley is usually cut with the scythe, treated like hay in the saving, and put into rick or *mow*, as it is termed, heads and tails, higgledy piggledy.

"In Scotland it is cut, as in Ireland generally, with the reaping-hook, and when sufficiently dry, bound up and stacked. The cause of this difference of treatment is the *difference of climate*, which in all our theories should be taken into consideration. If barley, on an average of years, were to be harvested in Scotland (and the same rule holds for Ireland) as in England, it would lose its colour, and consequently its value to the maltster. The safest mode, therefore, is to bind and stack this as well as other grain; and admitting the necessity of so doing in *Scotland* (where crops are usually clean) from the *dampness* of its climate, and the probable loss of corn which would be occasioned there by raking barley together in wind-rows after heavy rains and dews, which loosen the grain most wofully, a still greater necessity for treating it in a similar way in *Ireland* must be obvious, where (with the humidity of atmosphere) weeds so often are allowed to grow in profusion through the corn.

"Much loss is incurred in the reaping, binding, and stooking—in the forking in the fields, and from the carts, and from the over-ripening of corn. (See *Criteria of the Ripeness of Corn.*) Experience and observation alone can teach the precise time for cutting corn; but the Irish farmer is in the extreme error of allowing over-ripening of all corn. We do not wish to see an attempt to cut *too soon;* for in this case, especially with wheat, we should have a shrivelled grain and light weight; but we want to see promptness and energy when the critical time arrives. The loss of a day in this case may be the loss of many pounds sterling, in the quality and quantity of the corn, in labour, and in vexation at losing opportunity; for though we can satisfactorily do many things by deputy, it is impossible to fret by proxy. No farmer, however rich, can hire a fretter for the season. If the harvest be wet, however usually patient and submissive to the decrees of Providence he may be, he cannot help *some* fretting; and if by his own supineness, or procrastination, or submission to old-fashioned prejudices he has lost his good days for harvesting, he will fret in downright sadness, and no *good* farmer will pity him in his vexation."

As soon as possible after corn has been put into sheaf, it should be removed from the field; it is miserable management to leave small stacks on the stubbles so long as to *scald* the young grass seeds underneath—if the land has been laid down—or to prevent the plough from operating at the earliest period.

HAY—Grass dried for fodder. This is generally so much dried, and so sapless, as to be no better than straw in supplying nutriment. Hay ought to contain as much of the natural juices of the herbage as possible, and, therefore, the grasses when cut should not be allowed to lie bleaching under wind or sun, until a great portion of their nutritious qualities has escaped. The best flavoured and most nutritive hay is that which has had an early fermentation, and the least possible exposure to weather.

HAY-MAKING.—Meadows should be cut when the grasses are coming into full flower, and while they retain their succulence; if allowed to flower and ripen fully, the saccharine matter is absorbed from the stems into the seed lobes, and is either dispersed upon the land, or consumed by birds. Rye-grass, in particular, should be cut before the seed has in any degree ripened, else the stem becomes hard and wiry, and loses its juices.

When the weather is favourable, it is better to mow, even if the crop be under-ripe, than to postpone the mowing on the *chance* of a continuance of favourable season. By cutting early, the after-grass will be more abundant, and the land itself less exhausted, than if the grasses were allowed to attain perfect maturity.

The act of mowing consists in shaving the crop as closely to the ground as possible, and pointing the swaths well out, so as to leave no irregularities between the different sections made by the scythe.

When it is decided that the meadow is sufficiently ripe, a set of mowers, in proportion to the extent, should be provided without delay, either at task-work or by the day, and hay-makers, (of whom half may be women or boys,) in the proportion of four or five to each mower, according to his abilities of labour, the state of the weather, and the quality of the grass.

> "Seasons may and do vary; even with the wisest plans and most energetic efforts, great perplexity will occasionally exist; but still, take one summer with another, hay of the finest quality may be, and is, made and got together in a very few days; and he ought to be considered as an ignorant or bungling farmer, who could not cut, make, and finally secure, a hundred acres of the heaviest crop of grass between Monday morning and Saturday night."*

Mr. Towers, the writer of the above, ridicules an Irish steward for conceiving that he had effected much in having forty-three acres of meadow cut and ricked in *three weeks* from the *cutting*. What will the *English* farmer say to it? Why, that it was very slow work; but the *Irish* hay-farmer, whatever he may *say*, must acknowledge, that, according to the practice and *climate* of Ireland, Mr. Flanagan (the steward, and writer, too, in the Irish Farmer's Magazine referred to) was not asleep, but up and stirring, and giving due regard to the adage, "make hay while the sun shines." Mr. Flanagan's despatch, however, becomes a mere dawdling process compared with that of a Somersetshire farmer, who thus expressed himself to Mr. Towers:

> "I have been a hay-maker nearly forty years, and have hardly in one instance failed to carry in good condition. *In the month of June, earlier or later, there are three or more days* wherein the wind blows *from the north-east, and that period is always dry.* When that wind first occurs, I seize the moment, call in the hands, cut the grass, and carry the crop before the wind veers to the south."

The following observations are extremely judicious:—

> "The great art of converting grass into hay, consists in rendering it sufficiently dry to prevent its taking on too great a degree of heat in the stack or mow, and at the same time preserving a large proportion of the natural juice of the plants. Where the medium can be obtained with the greatest exactness, the best and most nutritious hay will be produced. It is, however, a difficult point, that requires much care and attention. In fine seasons, the danger is of not making it sufficiently,

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* Mr. Towers on Hay-Making, Quarterly Journal of Agriculture, No. 41.

while in those of the contrary description, it is apt to be made too much. This is fully evinced by the great inconveniences that are frequently sustained from the heating of the stacks in the former cases, while in the latter it is but seldom heard of. It has been suggested by an accurate observer, that in the making of hay 'some attention should be paid to the quality of the soil and to the kind of herbage growing upon it. The hard, benty hay of a poor soil is in little or no danger of heating in the stacks; it should therefore be put together very early, in order to promote a considerable sweating, as the only means of imparting a flavour to it, which will make it agreeable to horses and lean cattle, as it will be nearly unfit for every other sort of stock. It is the succulent herbage of rich land, or land highly manured, that is most likely to generate too great a degree of heat; of course, grass from such land should have more time allowed in making it into hay. In moderately hot seasons the proper time of drying may be easily judged of; but when they are very hot and scorching, it is easy to be mistaken, as in such weather the grass becomes crisp, rustles, and handles like hay, before the moisture or sap is sufficiently dissipated for it to be in a fit state to be laid up in large stacks. If that, however, be done when it is thus insufficiently made, it mostly heats too much, becoming mow-burnt in some cases.'

"There is another circumstance, which, though difficult in many cases to be performed, is of much consequence; this is that of carrying the whole of the hay just at the moment it is sufficiently made, which is necessary in order to its yielding the greatest possible weight, and preserving the best quality, as every minute after that precise time, it continues to lose both in weight and in its nutritious qualities by evaporation, as is evinced by the smell. Even the difference of an hour, in a very hot drying day, is supposed to occasion a loss of fifteen or twenty per cent. on the hay, by its being carried beyond the point of perfection, and frequently even a greater loss is sustained."*

The following is an abstract of Mr. Middleton's report of the Middlesex mode of hay-making:—

"In the first day's process, all the grass mown before nine o'clock in the morning is tedded or spread out, great care being taken to shake it so as to leave it free from lumps, and to strew it evenly over the whole surface of the ground. It is soon afterwards turned, with an equal degree of care and attention; and if the number of hands be sufficient, they turn the whole again, or at least as much of it as they can before twelve or one o'clock. It is then raked into what are called single windrows; or so that each person may form a row at about three feet distance; and the last operation of the day is to put it up into grass cocks. The business of the succeeding day commences by tedding all the grass that was mown the first day after nine o'clock, and all that was mown this day before that hour. The grass cocks are then well shaken out into what are called staddles, which are separate plots of five or six yards in breadth. Where the crop is so thin and light as to leave the spaces between the staddles rather large, they are immediately raked clean, and the rakings mixed with the other hay, in order to its all drying so as to be of an uniform colour. The staddles are next turned, and after that the grass that was tedded in the first part of the morning once or twice, in the same manner as described in the first day. This business should all be performed before twelve or one o'clock, that the whole may lie drying while the people are at dinner. After this, the first thing is to rake the staddles into double windrows, which is done by every two persons raking the hay in opposite directions, or towards each other, forming a row between them of double the size of the single windrows, each being about six or eight feet distant from the other. They afterwards rake the grass into single windrows; then put the double windrows into bastard cocks; and conclude by putting the single windrows into grass cocks. The labour of the third day is begun by first tedding and spreading out the grass mown, and not spread the preceding day, as well as that mown in the early part of this day; and then the grass cocks are thrown out into staddles as before, and the bastard-cocks into staddles of less extent. These narrow straddles though last spread out are first turned, then those which were in grass cocks; and lastly the grass is turned once or twice before twelve or one o'clock. When the weather has been sunny and fine, the hay which was last night in bastard cocks, will, this afternoon, be in a proper state to be carried, as in fine seasons it may mostly be performed, on the third day; but when the weather has been cool and cloudy, no part will be probably fit to carry. In that case, the first business after dinner is to rake that which was in grass cocks last night into double windrows, then the grass which was this morning spread from the swaths into single windrows. After this, the hay which was in bastard-cocks last night, is made up into full-sized cocks, and care taken to rake up the hay clean, and also to put the rakings on the top of each cock. And lastly, the double windrows are put up into bastard-cocks, and the single ones into grass-cocks as in the preceding days. On the fourth day the great cocks just described are mostly carried before dinner. The other operations are similar to those of the former days, and proceed in the same order, continuing them daily until the whole is finished.

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* See Irish Farmer's Journal, Vol. 9, p. 353.

"During the whole course of hay-making, the grass should, as much as possible, be protected, both in the night and day, against rain and dew, by cocking.

"In districts where the hay season is later, and the weather more changeable, it would often be dangerous to expose the hay so much abroad as in the above process; a more cautious method should probably be adopted.

"In such cases, instead of keeping the hay almost constantly spread out and exposed to the atmosphere, as in the preceding method, it may be better to put it into small cocks soon after it has been cut down and become a little made; these should then be frequently turned over, but not spread out except when the weather is in such a fine state as to insure their being put up again in the same state, without injury from the falling of rain. This method is much more slow, though the hay is much less exposed to danger in wet weather, than in that which has been described above; and when there is much heat it may be made with very little trouble or expense, and without much expenditure of its nutritious juices.

"Another practice that has been found useful in such situations is, to break out the grass that is mown, turn and windrow it on the first fine day, and also to put it into small cocks when the ground is dry; on the next fine day a few of the cocks are broken out at a time, and kept constantly turned until fully dry. Three or four of them are then put into one cock, the work proceeding in the same manner till the whole is done. And when the weather is bad, these cocks are never rebroken out, being only lightened up to let the air pass through them more freely. The advantages in the first mode are supposed by some to be, that from the regular tedding that is given, the hay becomes more valuable in quality, heats in the stack or mow in a more uniform and equal manner, and cuts out better in the truss.

"No more of the produce should be thrown out than can be put into cock the same day, or before it is injured by a fall of rain. When the weather is unsettled, it may often be permitted to remain in the swath for several days, only taking care that the undersides do not become discoloured by turning them over by the head of the rake. In this way it will frequently be so much made, in a few days, as to require little tedding afterwards to form good hay. The preserving hay of a proper green colour is a circumstance of some importance. In order to effect this, the bastard-cocks, previous to their being carried, should be put up in the heat of the day, and remain in that condition till the following morning, when they must be turned and opened so as to dispel any damp that might induce it to heat in the stack, and in that way spoil the colour. The acquisition of a lightish brown colour in the stack is not found injurious to hay, but when it becomes of a dark brown from too much heat, it is said to weaken and relax horses that are fed upon it, by its powerful diuretic properties. It is of course inferior in quality.

"When hay heats to such excess as to putrify, the cause is not the fermentation of the natural sap of the hay, but atmospheric moisture; great care, therefore, should be taken in damp weather not to put hay together in large cocks, especially if it has been even once wet, (unless it has been perfectly dried afterwards,) for in such case it will certainly heat."

Mr. Fraser, in his statistical survey of the county of Wicklow, states, that at Inverary, the Duke of Argyle's steward was at one time in the habit of taking all the grass, (never mown until the dew had evaporated,) as fast as it was cut, to extensive cattle-sheds, where it was spread out, made, and expeditiously stored in the lofts above, or into cocks, and afterwards stacked; bullocks brought in from grass were fattened on it without any other food; the horses fed with it required little corn, while hay, bleached by the sun and rain, is hardly sufficient to keep them from starving.

Now the excellence of this hay unquestionably arose from allowing *early* fermentation to take place, which is essential in the saving of hay in order to bring forth its saccharine qualities. The smell and colour will give testimony that this process has taken place.

As the importance of promoting fermentation in hay from its own juices is not sufficiently considered, it may not be amiss here to state a method of making clover hay, practised by the Rev. Mr. Klapmeyer, of Wormen, in Courland: the details were furnished by Mr. John Taylor to the editor of the Irish Farmer's Journal.

"In the method of making hay, recommended by the Rev. Mr. Klapmeyer, not only a number of hands are saved, but the hay is better and more nourishing. The hay is prepared by self-fermentations, whereby it retains its nutritious juices, and only loses its watery particles; it is dried more expeditiously by dissipation of its humidity, and contraction of the sap-vessels, and then its nutritious juices are concentrated. This process is conducted in the following manner, viz.:—The sap vessels are expanded by the circulation of the liquid juices by heat, and the superfluous humidity is exhaled; on cooling, the sap-vessels contract, and thus future intestine fermentation is prevented, and the nutritious quality preserved. Upon this principle the clover intended for hay, after having been mown, remains till four o'clock in the afternoon of the following day in the swath to dry; it must then be raked together into small cocks, and afterwards made into large cocks in the form of a sugar-loaf, and such as would require six or eight horses to remove. To prevent the air from penetrating these cocks, and to produce a quicker fermentation, they must, while forming, be trod down by one or two men. If it be a still, close, warm night, its fermentation will commence in four hours, and manifest itself by a strong, honey-like smell; when a proper fermentation is began, the cocks will, on being opened, smoke, appear brownish, and may then be spread abroad. If in the morning the sun is warm, and a little wind rises, the clover-hay will quickly dry; it may then, towards noon, be turned with the rake or pitchfork, and about four in the afternoon will be sufficiently dry, so that it may be immediately carted into the barn without any danger of a second fermentation.

"By this method of management the clover will require only three days from the time of mowing to its being housed, and very little work; whilst in the common way, even in good weather, it requires six or eight days. In the old method it frequently becomes of a black colour; but in the new method it is only brown, has an agreeable smell, and remains good and unchangeable in the barn. The farmer has also another advantage, that if he has not carts enough to carry it into the barn, he needs only at sun-setting to heap it again into large, well-trodden cocks, and thatch them with straw, in which state they will remain the whole summer without damage or loss. This clover-hay is not only greedily eaten by sheep and lambs, but also by horses, calves, and cows. The last prefer it to the best meadow hay; it produces a great quantity of rich milk; and the butter from it is almost as yellow as summer butter.

"As this new method of making hay depends principally upon circumstances—first, that the mown clover, when brought together into large heaps, may ferment equally and expeditiously; secondly, that the day succeeding the fermentation be dry, sunny, and windy—on this account it may be proper to point out what should be done when circumstances are unfavourable.

"Let us suppose, therefore, that the night after the clover-grass has been placed in the great-cocks, be cold, damp, or rainy, the fermentation will yet take place, although it may require a term of twelve, sixteen, or twenty-four hours to effect it. If it be a second or third crop, at which season the nights are colder, it may even require from thirty-six to forty-eight hours before the fermentation ensues; it will, however, commence, and may be ascertained from this circumstance, that you can scarcely bear your hand in the interior of the cock. Even if the night be dry, yet if a strong, cold wind blows, the cock may not ferment equally, but only in the middle and on the side opposite to the wind; the other parts may remain green. In such a case the following rules must be attended to:—

"First. If the cock has only fermented in the middle and on the side opposite to the wind, the whole heap must nevertheless be opened the following morning. That which has already fermented must be separated and spread to dry; it must be turned towards noon, and may be carted into the barn in the evening; but that part of the cock which has not fermented, must again be put together into large cocks, and fermented in the same manner as the preceding part, after which it may be spread to dry, and brought into the barn.

"Secondly. In such cases where a small portion of the cock has fermented thoroughly, but not the greater part, the heap must be spread abroad in the morning, but must again be made into a close cock in the evening, in such a manner that the part which has fermented be placed at the top or outside of the cock, and that which has not fermented be enclosed within it; then on the ensuing morning, or if the weather be cold and rainy, on the morning afterwards, the clover heap may be again spread abroad, and the clover treated as in case No. 1.

"Thirdly. If in spreading the heap abroad, it be found that nearly the whole of the clover has fermented, it will not be necessary to delay the housing of the whole on account of some small portion; but the clover may be dried and carted into the barn. The small portion of clover which remained unfermented will not occasion any disaster to the other which has fermented; for there is a material difference betwixt hay thus managed, and the meadow-grass which is brought whilst damp, or wet with rain into the barn, which will grow rusty and putrid.

"Fourthly. In such instances where some of the cocks of clover have thoroughly fermented, and it rains in the morning, they ought to be spread abroad, even if it rains violently; since if it was suffered to lie longer in the heap, it would take fire, or its juices would be injured by too much fermentation; the leaves and stalks would become black, and the clover unfit for food; therefore if the rain continues, spread clover must be turned from time to time, but not carted into the barn till dry. This drying takes place, if the rain discontinues for a few hours, much more expeditiously with the clover which has fermented, than with that made in the common way. Besides which, it must be remarked, that the fermented clover remains good, even if it continues some weeks exposed to the rain, provided it is at last suffered to dry before it is put into the barn; otherwise the wet from the rain will render it musty and bad. The clover which has been for so long a time exposed to the rain, will not, however, be so nutritious as that which has been well fermented and sooner dried; but it will be far superior to that which has been exposed to the rain, and got up in the common method.

"If the weather should be remarkably hot, you may, by adopting this plan, prevent a frequent accident; for grass hastily made into hay, however dry it may appear to the hand, contains within its fibres much humidity; and when trod down in the stack will ferment rapidly, from this humidity endeavouring to escape, which often fires the stack. A certain degree of fermentation is necessary in the making of hay, in order to develop its saccharine qualities, and make nutritious food. This saccharine fermentation is evident, from the smell and colour of the hay in common stacks, and from tasting an infusion of it; it resembles in some degree the process of making malt from barley, and requires a similar attention. I have no doubt that the method above related will prove generally advantageous in making clover, lucerne, and meadow-hay in England, and lead to valuable improvements in agriculture."

In wet weather hay may be preserved for a long time in lap cocks, so called from the small size of the parcel of grass which is rolled up with a peculiar sleight into the form of a lady's muff, admitting the air while it resists the rain.

HAY-RAKE.—The hay farmer on a large scale finds his account for the purpose of *expedition*, so essential in hay-making, in using a rake drawn by a horse or pony in shafts. This implement has a wheel at each end, and a pair of handles behind, by depressing which, the driver lifts the range of teeth from the ground, when he reaches a windrow, and then after crossing it, lowers his handles again until he reaches the next, and so on. This rake acts on the same principle with the couch-grass rake, which it nearly resembles.

HAY-RICK.—This should be laid on stones, faggots, or other dry material. If built on pillars, with wooden stretchers connecting them, a shed for cattle, straw, or implements, is obtained without cost or inconvenience. The oblong shape is the most convenient for cutting off and trussing portions. A tarpaulin is of great use in guarding from rain or dew during the formation of the rick, and where this is at hand, the field cocks can be brought to the stack as fast as they are sufficiently saved. Unless for horses, which must be limited in their allowance of water, it is desirable to sift salt very evenly through each course of hay, at the rate of fourteen pounds to the ton. This makes the hay highly palatable and wholesome.

Ventilation by means of tunnels (formed during the process of stacking by a sack filled with hay, or a barrel drawn up gradually as the work advances) is not recommended. It is considered better, if there be cause of apprehension from dampness, to mix layers of straw through the hay. A neat farmer will thatch his rick immediately after it is finished, and bind down the covering with straw ropes. The quantity contained in an oblong stack may be very nearly calculated by multiplying the length, breadth, and height together, and dividing by ten—the number of cubic yards which will, on an average, weigh a ton. Of old hay, (two or three years made,) eight yards will probably yield a ton. Of clover hay, which cannot be so easily compressed, twelve cubic yards will be the average quantity for a ton. Grass, when dried, loses about three-fourths of its weight, and afterwards twenty per cent. by fermentation and exposure to weather, and about ten per cent. more in the course of a year.

It is much to be wished that the English mode of trussing hay for market were practised in Ireland. Even in the neighbourhood of Dublin it is unknown, and in consequence, the horses which carry hay to the market there, on one horse carts, often suffer severely from the unevenness with which the load of uncompressed hay presses upon them.

The operation of trussing is thus explained in the 1st vol. of British Husbandry.

> "The cutting is commenced at the end which is the least exposed to the weather, and should be begun at the left-hand corner. The binder begins by forming 'thumb-bands' of the most inferior hay for tying up the trusses; in making which he is assisted by a boy, who holds both ends of a wisp of damped hay between his hands. He then catches the wisp with the crook of an implement called, in different places, a 'twiner,' a 'throw-cock,' or a 'windle,' which is made of a circular piece of iron about a foot and half long, inclosed in a hollow tube of wood. This he grasps with his left hand, and then turning the handle, the crook revolves in the tube, and the band is instantaneously twisted. This done, he measures the cut to be made in the stack, which is decided by the usual size of the trusses —each being as nearly as possible three feet by two and a half, and thick in proportion to the fineness and closeness of the hay; those of the best quality being the thinnest. He then mounts the ladder and cuts perpendicularly through the thatch, as far down as will produce the requisite number of trusses. This he does with a very strong and sharp knife, about thirty inches in length, by nearly six in breadth of blade. The handle is, however, often made short and straight from the blade, but the form above represented allows of more power being exerted by the workman in cutting through the stack, and it is an operation which demands considerable strength. Having cut the necessary quantity, he next uses an iron spike, nearly three feet in length, with a small handle in the top, which he thrusts into the truss, and thus separates it in nearly its exact weight from the stack; afterwards laying it upon a weighing machine, and furnished with a 56lb. weight, though steel-yards are sometimes used, but are not more convenient, while they are more expensive. The machine can be made by any common carpenter of a size to hold a truss of hay, the height about four feet, and of a proportionate strength, for less than fifty shillings.
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> "The truss is then encircled by the bands, at about ten inches from each end, being afterwards turned under, as a tie, in the same manner as those of sheaves of corn. An expert hay-binder can thus truss two loads in his day's work; and the common price, if done by the job, is 2s. 6d. per load. It will be readily conceived that this mode is preferable to that of delivering hay loose; for, although it occasions the charge of binding, it yet secures it from every kind of waste; it is accurately weighed, securely loaded upon the cart, occupies the smallest space, and can be easily carried or delivered, without difficulty, through a loft-window."

HEDGES—(See *Fences.*)

HEDGE-BIRDS.—To those who are very curious upon this subject, we recommend the perusal of two very full and interesting articles in the Quarterly Journal of Agriculture, Nos. 33 and 35. Many birds referred to there are so little known, except in particular localities, as to render any notice of them here unnecessary. The hedge-birds decidedly serviceable to the farmer, and gardener also, from living entirely on insects, are the gold-crested wren, the wood-wren, and the willow-wren, or hay-bird, (called in Scotland the *busket leddy*,) wag-tails, tit-larks, and the cuckoo, which is a voracious devourer of insects.

The common wren, the hedge-sparrow, the red-breast, and the tom-tit, feed on seeds and fruits as well as upon insects, but they are on the whole more serviceable than injurious, and, therefore, ought not to be destroyed or persecuted merely because they occasionally take a seed. Mr. Knapp, an admirable writer in the journal referred to, thus expresses himself—

> "An item passed in one of our late church-warden's accounts was 'for seventeen dozen of tom-tit's heads!' In what evil hour, or for what crime, this poor little bird could have incurred the anathema of a parish it is difficult to conjecture. In summer, it certainly will regale itself with our garden peas, and shells our pods of marrow-fats with great dexterity; but this, we believe, is the extent of its criminality. Yet, for this venial indulgence do we proscribe it, rank it with vermin, and set a price upon its head, giving four-pence for the dozen, probably the ancient payment when the groat was a coin. However powerful the stimulus was then, we yet find it a sufficient inducement to our idle, bat-fowling boys to bring baskets of poor tom's heads to our church-warden's door."

There is undoubtedly an innate disposition to cruelty in mankind; in proof of this we point to the instinctive passion of children for robbing birds' nests, deliberately destroying the young, throwing stones at the helpless unwinged rook, and the familiar tom-tit, who, from being an impudent and fearless little fellow, ought, we should suppose, to be the school-boy's favourite.

The latter bird is really useful in taking from the young buds the worms which lodge in them; it pecks into the bud and extracts the worm, which, if left there, would, with its progeny, consume not only its cradle, but many other buds.

The hedge-birds which, more or less, are destructive to corn fields, orchards, and gardens, are the house-sparrow, chaffinch, linnet, goldfinch, bull-finch, yellow-hammer, and bunting. It is said by Buffon that

> "A single pair of sparrows consume nearly twenty pounds weight of corn every year; and, taking this and their prodigious numbers into consideration, what enormous destruction must they make over our fields, for, though they feed their young with insects, they chiefly subsist on the best grain. They follow the sower in seed time, and the reaper in harvest; they attend the thrashers at the barns, and the poulterer when he scatters grains to his fowls; they visit the pigeon-houses, and pierce the craw of the young pigeons to extract the food; they also eat bees, and are thus disposed to destroy the only insects useful to man."

Three thousand have been caught in a single net in one day. The sparrow is unfortunately very prolific; a pair will rear a dozen or more young ones in the year. Yet this bird, though a surprising consumer of corn, has had his warm advocates. Mr. Jesse, in his third series of gleanings, remarks—

"That it will feed on corn and peas, there can be no doubt; but this may be in a great measure prevented by setting boys to watch during the short space the corn is ripe. With this exception, I believe sparrows are of the greatest utility to the farmer, devouring myriads of insects which would otherwise do him infinite injury. This is particularly the case when they have young ones, all of which are fed with insects and caterpillars; and I feel convinced that they would not have been so generally distributed over most parts of the world, had they not been intended for some useful purpose; indeed, many observant persons are now aware that, in places where sparrows have been destroyed, some sorts of fruit-trees have been stript of their leaves by caterpillars."

The French translator of Dr. Beckstein states, "that the destruction of sparrows has been so great an evil in the countries where the government had ordered it, that it has been found necessary to rescind it;" and Mr. Knapp adds—

"Sparrows seem to be appointed by nature as one of the agents for keeping from undue increase another race of creatures, and by their prolificacy they accomplish it. In the spring and early part of the summer, before the corn becomes ripe, they are insectivorous, and their constantly increasing families require an unceasing supply of food. We see them every minute of the day in continual progress, flying from the nest for a supply, and returning with rapid wing with a grub, a caterpillar, or some reptile, and the numbers captured by them in the course of these travels are incredibly numerous, keeping under the increase of these races, and making ample restitution for their plunderings and thefts."

But the writer himself of the Essays in the Journal of Agriculture is of a very different opinion.

"I find, indeed, that even in the mildest winters, the sparrows extensively disbud the trees and shrubs in my garden, more particularly the red or white currant buds, though they seldom, if ever, touch those of the black currant. The blossom-buds of the lilac are also occasionally attacked. A pair of sparrows, indeed, will do more damage in this way in an hour, than all the caterpillars hatched on these trees in the most prolific years will do in a whole season. Millar remarked, long ago, that the sparrows also disbud the carnations, picotees, and pinks; and I observed, last spring, that they not only devoured the buds, but the younger leaves of carnations, leaving on some plants little besides the naked stumps. At first, on observing the circumstance, I imagined the leaves had been eaten by cats, as they had eaten down a clump of garden grass near at hand, till I repeatedly saw the sparrows nibbling at the carnations with their sharp-edged bills, that cut like a pair of scissors, and whether it is buds or grain, they can with such an instrument readily get at the core, which alone they eat.

"But, though all these are serious depredations, they appear to me not to be

> so injurious as another which is little noticed—the destruction of the braird of field and garden plants, by cutting off the seed-leaves the instant they come through the ground. Every gardener and farmer knows that sparrows destroy great quantities of seed after it has been sown, particularly spinage, lettuce, radish, turnip, and cabbage; but when these plants come up, the depredations of the sparrows are increased rather than diminished, though the snails, slugs, and caterpillars usually get credit for the damage. It was, indeed, some time before I could convince myself it was the sparrows that ate off whole rows of my peas and spinage, and beds of radishes, and seedling cabbage, being rather pleased to see them alighting on the brairds, thinking the opinion right that they were clearing away insects. A single experiment proved that the sparrwos were indubitably the aggressors. Threads studded with feathers were stretched across the beds, which so effectually scared the sparrows, that they never ventured again to alight upon them, and the seedling plants grew undisturbed, while other beds left unprotected, were as before entirely stript of the plants. Pigeons will do the same both with peas, lettuce, and spinage, but they are not worse than the sparrows.
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> "The turnip-fly, it is but too well known, does extensive damage to the turnip crops in the seed-leaf, but I have no doubt that the fly is frequently accused when there is no fly to be found, in the same way as I accused the slugs and caterpillars of eating my young cabbages, lettuce, and radishes. The field crops of turnips, indeed, appear in their seed-leaf just about the time when the sparrows begin to collect in numerous flocks in the hedges, and as one sparrow will nip off several dozen seedling turnips at a meal, the damage done by a flock of fifty or a hundred resorting every day to a turnip-field must be immense. I do not speak from conjecture; I had a bed of turnips in my garden the last spring entirely eaten off by the sparrows before I was aware of the cause, and I recollect that a year or two ago a neighbour had a similar loss, which he attributed to the fly, but though I myself carefully looked over this bed two or three times a-day to discover the fly, I never observed one—I have not the slightest doubt that it was the sparrows alone. I cannot too strongly impress this upon the attention of turnip-growers."

Chaffinches are seen wherever there is a bush or tree; the parent birds feed their young with insects, and also partly subsist themselves upon them, but they live in a great measure on corn, and seeds of all kinds, and are expert at shelling the grain in order to obtain the kernel. They are, however, easily frightened from attacking newly sown seeds, and, as they devour aphides, plant-lice, and other insects, in considerable numbers, it is doubtful whether their industry in this respect does not counterbalance the extent of mischief which they may sometimes occasion.

Linnets, which are very wary birds, go forth with their numerous broods after they become fledged, into corn-fields, and consume the standing grain near hedge-rows, and the autumn sown wheat, in large quantities.

Goldfinches are not numerous, and are of such beautiful plumage, and so docile and musical as to be universal favourites. They eat thistle-seed and groundsel eagerly, and though they destroy some garden seeds, they are so easily kept off by a little watchfulness as to have an exemption from persecution.

Bullfinches are destructive in gardens and orchards, from their attacks on young buds of fruit-trees, nor do they atone for their acts of robbery, by consuming insects. They are, therefore, among the proscribed by the gardener and orchard-man.

The yellow-hammer, like the other birds, feed their young upon insects and caterpillars, but they themselves are fond of grain, which they take without scruple from the corn-field as soon as it is sown, and when brairding.

Buntings, though not numerous, are rather formidable visitors to the corn-fields, from their size; they subsist entirely upon grain, when it is to be had by any means.

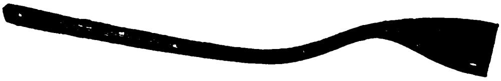
> "I am neither," he says, "inclined to seek after, nor desirous of detailing the little annoyances that these wildings of nature, in their hard struggles for existence, may occasionally produce; being fully persuaded that the petty injuries we sometimes sustain from birds are at others fully compensated by their services. We too often, perhaps, notice the former, while the latter are remote, or not obtrusive. I was this day, (January 25th,) led to reflect upon the extensive injury that might be produced by the agency of a very insignificant instrument, in observing the operations of the common bunting, (Emberiza Miliaria,) a bird that seems to live principally, if not entirely, on seeds, and has its mandibles constructed in a very peculiar manner, to aid this established appointment of its life. In the winter season, it frequents stacks in the farm-yard, in company with others, to feed upon any corn that may be scattered about; but, little inclined to any association with man, it prefers those situations which are most lonely and distant from the village. It could hardly be supposed that this bird, not larger than a lark, is capable of doing serious injury; yet I this morning witnessed a rick of barley, standing on a detached field, entirely stripped of its thatching, which this bunting effected by seizing the end of the straw and deliberately drawing it out, to search for any grain the ear might yet contain; the base of the rick being entirely surrounded by the straw, one end resting on the ground, and the other against the snow, as it slid down from the summit, and regularly placed, as if by the hand; and so completely was the thatching pulled off, that the immediate removal of the corn became necessary. The sparrow and other birds burrow into the stack and pilfer the corn, but the deliberate operation of unroofing the edifice, appears to be the habit of the bunting alone."

When sparrows become so numerous as to become Destructives, the conservative farmer is obliged to shoot them on the hedges, or wherever he finds them congregated! Threads with feathers on them will keep them from garden seedling-beds!

HEDGE-KNIFE.—Of this there are two sizes, to be used with one or two hands. The former is a common and well-known implement. The larger one should have the blade twenty inches long, by two-and-a-half broad, and the handle three feet. It is often more curved at the point than is represented in the plate;

"but this is an imperfection, as it renders it more liable to be caught in its ascent (for the blow should be always upwards) by a twig or branch, which turns it in the hand."*

HEDGE WEEDING SPADE.—



This somewhat resembles a small Irish spade, and is useful in weeding hedges. The edge is about three inches broad, and well steeled, and the neck is curved, and tapered towards the handle, to admit of its free introduction among the quicks.†

HEMP—A plant of the nettle tribe—was originally from India, and is not suited to our cold climate, on which account it is but little cultivated by us. In Lincolnshire and Suffolk it is grown by some farmers, and there it reaches the height of six or seven feet, which, however, is very inconsiderable compared with its growth in warm climates, where it is not unusual to find it of the length of sixteen and eighteen feet.

The greater part of both hemp and flax grown and exported by Russia, is from the patches of land connected with the dwellings of the peasantry, cultivated by them, and dressed during the winter months, when they would be otherwise unemployed. The quality of British hemp, *well manufactured*, is far superior in strength to that of Russia or India.

Old deep meadow-land of moist quality, and all rich alluvial, and *peaty* soils (if well-manured) are especially suited to hemp. The deep lands of the counties of Tipperary and Limerick, in *favourable seasons*, would produce good hemp crops, and as there is usually a considerable demand, in those counties, for the manufactured article—in a form to which we shall not more particularly refer—after the spring and summer assizes of each year, it may be worth while to speculate there upon the culture of hemp to the extent of a few hundred acres.

The quantity of seed (which should not be sown before the end of April) should be increased in proportion (three bushels is the average allowance to the statute acre) to the richness of the soil, in order to have a fine fibre, and care must be taken to keep birds from it when sown, as they are exceedingly fond of it. The whole treatment afterwards, is precisely similar to that of the flax crop; but the mode of pulling hemp depends upon the use for which it is designed.

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* Irish Farmer's Magazine. † Ibidem.

> "When the crop is grown entirely for the fibre, it is pulled when in flower, and no distinction made between the male and female plants. But, as it is most commonly grown both with a view to fibre and seed, the usual practice is to pull the male plants as soon as the setting of the seed in the females shows that they have effected their purpose. As the female plants require four or five weeks to ripen their seeds, the males are thus pulled so long before them.
>
> "In the *operation of pulling the males*, the pullers walk in the furrows, between the ridges, and across to the crown of the ridge, pulling one or two stalks at a time, and carefully avoiding to tread down the female plants. The male stalks are easily known by their yellowish hue, and faded flowers. They are tied in small bundles, and immediately carried to the watering-pool, in the manner of flax.
>
> "The *operation of pulling the females* commences when the seed is ripe, which is known by the brownish or greyish hue of the capsules, and fading of the leaves. The stalks are then pulled, and bound up into bundles, being set up in the same manner as grain, until the seed becomes so dry and firm as to shed freely. Great care should be taken at pulling, not to shake the stalks rashly, otherwise much of the seed may be lost. It is advised that, after pulling the seed, hemp may be set to stand in shocks of five sheaves, to dry the seed; but, in order to prevent any delay in watering, the seed-pods may be cut off with a chopping-knife, and dried on canvas exposed to the air, under some shed or cover. This last method of drying the seed will prove of great advantage to the hemp, as the seed and pods, when green, are of such a gummy nature that the stems might suffer much by sun-burning or rain, which will discolour and injure the hemp before the seed can be sufficiently dried upon the stalks. Besides, the threshing out the seed would damage the hemp in a considerable degree."*

The leaves of hemp are powerfully narcotic, and the oil extracted from the seed is much used by painters.

HOE.—This implement for loosening the earth about plants, or relieving the ground from weeds, is either a light instrument used by the hand, or a heavy one of a totally different construction, drawn by a horse. Of the former description, the triangular hand-hoe is the best for hoeing wheat and thinning turnips, cattle beet, &c., in drills, after the horse-hoe and triangular harrow have executed their part of the work. The common garden hoe and Dutch hoe, or scuffler, are best suited to garden labour, where scraping and scuffling are required. The hand-hoe is in general use in British husbandry, in cleaning corn and other crops, and especially in hoeing out wheat plants to the proper distances, by which their tillering is greatly promoted. The American hoe is a powerful instrument in loosening the new soil or cleared ground; a representation of it is here given.

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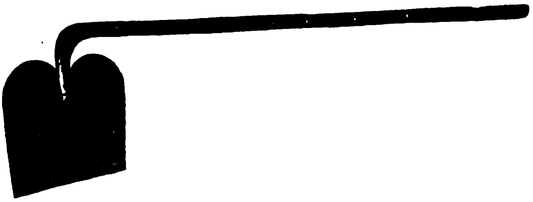
* Loudon's Encyclopædia of Agriculture.



The horse-hoe is of different forms. Wilkie's has three hoes. One attached like a coulter to a beam, at the point of which there is a wheel to regulate the depth; the other hoes are at the side of the beam, and can expand or contract according to the breadth of the drill: there is also a little drill-harrow attached, and this, following the coulters in their work, levels and cleans the track, without rendering the second operation a distinct one. The driver stands between a pair of stilts, as in the case of ploughing. Coulters or bent prongs are sometimes inserted in the beam where the ground is hard, instead of the hoe, which presents a wider surface. A small one-horse plough, divested of its mould-plate, serves the purpose of a hoe, by taking the earth from drill turnips, beans, potatoes, &c., laying the slices in the centre of the intervals, where they are levelled and pulverized by the drill-harrow. The earth, when thus treated, is laid up again to such plants as require earthing, by the same plough with its mould-plate screwed on again, or still better—with double mould-plates, if the plough be constructed for hoeing and moulding only. There are various machines on a large and small scale under the different names of scarifiers, cultivators, &c., for the purpose of loosening the soil, without bringing up a fresh surface. The importance of applying the principle of hoeing to practice, by implements of some sort, is incalculable, especially in foul and tenacious soil; and it is to this branch of husbandry, perhaps, more than to any other, that the luxuriance of crops, on very inferior soils in parts of England and of Scotland, is attributable.

HORSE.—This is one of the noblest of quadrupeds; in strength and natural boldness of spirit he is inferior to few, and yet he is easily tamed and rendered subservient to the uses of tyrant man, by whom he is often as brutally treated, as if he were one of the most ferocious and least valuable of animals.

The contrast between the noble bearing and agile movements of the horse, in a state of nature, (when, in the full and unrestrained flow of his animal spirits, he sweeps proudly foremost in the emulous gallop, or out-braves his fellows in the bounding leap,) and the spiritless, jaded, and submissive appearance which he presents in his premature decline, under the carrier's dray, or the dustman's cart, is painfully affecting to the benevolent mind. If gently treated, and not worked too soon, or too much, the horse lives to the age of twenty-five or even thirty years; but from early and continued ill-usage, his strength and constitution begin to fail before he has attained half this age.

Indeed it is more probable, that he does not average ten years in our country, from premature and excessive work, and bad feeding. "It may be safely asserted, that more horses are consumed in England in every ten years, *than in any other country in the world* in ten times that period, except those that perish in war."*

The age of the horse is ascertained with certainty by the teeth, until he passes his eighth year. We shall abridge from the able and copious treatise on the Horse, published by the Society for the Diffusion of Useful Knowledge, the necessary information on this subject.

"At the age of five, the mouth is complete, and the horse has forty teeth, six *nippers*, or incisors, in front, a tusk on each side, and six grinders above and below; † they appear gradually from the birth as follows:—

"Besides the two grinders above and below, which appear when the colt is born, the two centre nippers are perceived forcing their way through the gums, and in the course of seven or eight days are visible; in the course of the first month the third grinder appears above and below, and soon after another nipper appears in the upper and lower jaw, on each side of the first; at two months, the centre nippers are on their proper level, and in a fortnight afterwards the second pair overtakes them. Between the sixth and ninth month another nipper appears on each side of the two first, which completes the *colt's mouth*, and these become gradually worn and even.

"At the end of the first year the mouth is furnished, besides six nippers, with four grinders in each jaw, and these are admirably designed for their work, being provided with enamel, not only on the sides, but through the entire tooth. At the age of about eighteen months, a fifth grinder appears, and the first teeth are displaced by a new, and permanent, and larger set pressing outwards, and the gums are sometimes swollen and sore in consequence of an irregularity in the process—namely, when the new teeth do not come exactly under the milk teeth, (which, without dropping out, disappear through the process of absorption, by little vessels adapted to the purpose, and the part *above* the gums, drops out on the dissolution of the fang which held it,) but a little at one side, in which case the disappearance by absorption in the gums does not take place, and the aid of a *dentist*, to draw or punch out the supernumeraries, is required.

"At two years the mark in the central nippers will be much shorter and fainter, and all the nippers will be flat.

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* Animal Kingdom.

† These are in each jaw; by doubling these, the number of forty is made up.

"A horse, at three years old, ought to have the central, permanent nippers growing; the other two pair wasting—six grinders in each jaw, above and below—the first and fifth molars level with the others, and the sixth protruding.

"As the permanent nippers grow and press upon the teeth at their side, those teeth will begin gradually to diminish. Not only will the mark be wearing out, but the crowns of the teeth will be considerably smaller.

"At three years and a half, or between that and four, the next pair of nippers will be changed, and the mouth at that time cannot be mistaken. The central nippers will have attained nearly their full growth; a vacuity will be left where the second stood, or they will begin to peep above the gum; and the corner ones will be diminished in breadth, worn down, and the mark becoming small and faint. At this period, likewise, the second pair of grinders will be shed.

"At this period an attempt is frequently made by dishonest dealers, to give the three-year-old horse an additional year. This is done by extracting the central nippers, and the others appear three or four months earlier than they otherwise would, which gives the appearance of advanced age which they wish to present. The same fraudulent design leads them to perform the well-known operation of *bishopping old* horses to make them appear young.

"At four years, the central nippers will be fully developed; the sharp edge somewhat worn off; the mark shorter, wider, and fainter; the next pair will be up, but they will be small, with the mark deep, and extending quite across them; and the corner nippers, larger than the inside ones, yet smaller than they were, flat, and the mark nearly effaced; the sixth grinder will have risen to a level with the others, and the tusks will begin to appear.

"The tusks are four in number, two in each jaw between the nippers and grinders, much nearer to the former than the latter, and nearer in the lower jaw than in the upper, and this distance increases in both jaws with the age of the animal. In shape, the tusk somewhat resembles a cone; it protrudes about an inch from the gum, and has its extremity sharp-pointed and curved. The tusks are almost peculiar to the horse; but mares have the beginnings of them in the chambers of the jaws, and they appear externally in the majority of old ones. Their use is not evident—perhaps in the animal's wild state they were intended as weapons of offence.

"At four years and a half, or between that and five, the last important change takes place in the mouth of the horse. The corner nippers are shed, and the permanent ones begin to appear; the central nippers are considerably worn, and the next pair are beginning to show the marks of usage. The colt becomes a horse, and the filly a mare. At five years the horse's mouth is almost perfect; the corner nippers are quite up, with the long deep mark irregular on the inside, and the other nippers bearing evident tokens of increasing wearing; the tusk is much grown; the sixth molar is quite up, and the third molar is wanting.

"At six years the *mark*[*] on the centre nippers is worn out. There will still be a difference of colour in the centre of the tooth. The cement filling the hole made by the dipping in of the enamel will present a browner hue than the other part of the tooth, and it will be evidently surrounded by an edge of enamel, and there will even remain a little depression in the centre, and also a depression round this case of enamel; but the deep hole in the centre of the teeth, with the blackened surface which it presents, and the elevated edge of enamel will have disappeared. In the next incisors the mark is shorter, broader, and fainter, and in the corner teeth the edges of the enamel are more regular, and the surface is evidently worn. The tusk has attained its full height, is convex outward, concave within, tending to a point, and the extremity somewhat curved; the third grinder is fairly up and all the grinders are level; and now, or perhaps six months before, the horse may be said to have a perfect mouth.

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[*] "Dealers often talk of the filling up of the tooth. This is altogether a vulgar error. The mark never fills up. The peculiar cementing substance which occupies the funnel or pit made by the dipping in of the enamel, never grows up; but the ridge of enamel around it is worn down, and then the blackness at the bottom is rubbed off."

"At seven years the mark is worn out in the four central nippers, and fast wearing out in the corner teeth, and the tusk is beginning to get altered. It is rounded at the point, rounded at the edges, still round without, and beginning to get round inside.

"At eight, the mark is gone from all the bottom nippers, the tusk is rounder in every way, and there is now nothing which can clearly show the age of the horse or justify the most experienced examiner to give a positive opinion.

"Stabled horses have the mark sooner worn out than those at grass, and a crib-biter may deceive the best judge by one or two years.

"The general indications of old age, independent of the teeth, are, deepening of the hollows over the eyes, grey hairs, and particularly over the eyes and about the muzzle, thinness and hanging down of the lips, sharpness of the withers, sinking of the back, lengthening of the quarters, and the disappearance of windgalls, spavins, and tumours of every kind."

The poor animal when he dies, leaves for the use of his owner, (who seldom deserves any memento from him better than a kick, if he had the power of bestowing one,) his old shoes, locks of his hair—for sieves—and hair-cloths, and cabinet-makers and plasterers' purposes; and his skin to be used for the subjugation of others of his species, by being worked into collars, and straddles, and various other articles of horse furniture; and his bones, when many a hungry cur has banquetted on his putrefying flesh, are ground into dust for purposes of manure.

We have very early records of the domestication of the horse; whose native country, however, is uncertain, though he is probably of African origin.

The first allusion which we have to this animal in the Bible is in the 49th chapter of Genesis, though it has been conjectured by some that the waggons sent into Canaan by Joseph, were drawn by horses. Horses were, however, very rare among the Hebrews until the time of Solomon, who was the first king of Judah who had a great number of them, and these probably for mere pomp. He brought them from Egypt, and had the almost incredible number of 40,000 stalls;

although (in order to prevent any commerce between the Israelites and the Egyptians, lest the former should be infected with idolatry, or tempted at any time to return to Egypt) the multiplication of horses had been, by anticipation, forbidden to any of the Hebrew kings. From Egypt the horse was introduced into Arabia, where his capacity of fleetness, and endurance of fatigue, have been pre-eminently developed. From a letter written by Mr. Burckhardt, the celebrated and accomplished traveller in the East, to Mr. Savell of the Veterinary College, London, we learn that the present breed in Arabia is not very numerous, and is confined to the rich pasture districts—

"That the tribes richest in horses are those who dwell comparatively in the plain of Mesopotamia, on the borders of the Euphrates, and in the Syrian deserts. It is there that the horses can feed for several spring months upon the green grass and herbs of the valleys and plains produced by the rains, which seem to be an absolute requisite for its reaching to its full vigour and growth. The single tribe of Arabs, Montefek, in the desert watered by the Euphrates between Bagdad and Bassorah, has, at a moderate calculation, 8,000 horses.

* * * * * *

"The large tribes on the Red Sea between Akabea, and Mekka, and south and south-east of Mekka, as far as Yemen, have very few horses, especially those of the mountains. The richest country in this part of the East appears to be Mesopotamia; the tribes of Curdes and Bedouins in that quarter, very likely possess more horses than all the Arabian Bedouins together, for the richness of the pastures propagates their steeds. The best pasturing places of Arabia not only produce the greatest quantity of horses, but likewise the best and selectest breeds. The finest Koheyls of the Khomh are met with in Medjid on the Euphrates and in the Syrian deserts; while in the southern parts of Arabia, and especially Yemen, no good breeds of horses exist but those imported from the north.

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"As far as my knowledge goes, Syria is the best place to purchase horses of true Arabian blood, and no district is more convenient for that purpose than the Naaran, where the horse may be purchased from the first hand, and be chosen in the encampments themselves of the Arabs who frequent these plains in spring time. The horses brought up at Bassorah for the Indian market are purchased second-hand from Bedouin dealers; and an Arab will seldom undertake to send a good horse far off to the market with the uncertainty of selling it.

"True blood horses of the Khomzæ, I am credibly informed, seldom find, therefore, their way to Bassora, and most of the horses purchased there for the Indian market are belonging to the Montefek Arabs, who are most careful in maintaining a pure breed. It might, perhaps, be worth while for the great European powers to keep persons on purpose constantly employed in Syria in purchasing horses for them, as the best means to cross and improve their own studs. Damascus would be the best position for such purposes. I fancy that very few Arabians of the best breeds, and still less any first-rate horses of them, have ever been imported into England, although many Syrian, Barbary, and Egyptian horses have gone by that name."

The Rhouse breed is considered the highest and purest in blood, but even amongst these Mr. Burckhardt says there are few that may be called "the *first-rate* horses in either bone, beauty, or action. * * In the Syrian desert there are not perhaps more than 200 of that description, each of which may be worth there, from £150 to £200."

But it is useless here to dwell either upon the origin or the foreign breeds of this animal; it will be more profitable to take a brief notice of the principal varieties of the British draught-horse. But first may be noticed, as a matter of curiosity, the curious observations of Sir A. Fitzherbert, judge of the common pleas, in the reign of Henry VIII., who fancied himself a very good judge of the points of a horse, as he probably was in reality of points of law. In his "Boke of Husbandry" he states,

> "Thou grasyer that mayst fortune to be of myne opinion or condytion to love horses and young coltes and foles to go among thy cattle, to take hede that thou be not beguiled as I have been a hundred tymes and more. And first, thou shalt know that a good horse has 54 properties, that is to say, 2 of a man, 2 of a badger, 4 of a lion, 9 of an oxe, 9 of a hare, 9 of a fox, 9 of an ass, and 10 of a woman."

Not having the advantage of access to the rare work from which the above extract is given in the admirable treatise on the horse, in the Library of Useful Knowledge, we cannot tell whether the learned judge has specified these fifty-four points, but beg leave to substitute a quaint plagiarism (we ourselves, by the way, are plagiarists to an alarming and unreasonable extent) quoted in a note in the work to which the last reference has been made, which gives a very good general notion of the qualities of a horse.

> "A good one should have 3 qualities of a woman, a broad breast, round hips, and a long mane; 3 of a lion, countenance, courage, and fire; 3 of a bullock, the eye, the nostrils, and joints; 3 of a sheep, the nose, gentleness, and patience; 3 of a mule, strength, constancy, and foot; 3 of a deer, head, legs, and short hair; 3 of a wolf, throat, neck, and hearing; 3 of a fox, ear, tail, and trot; 3 of a serpent, memory, sight, and turning; and 3 of a hare or cat, running, walking, and suppleness."*

For general purposes it is now universally acknowledged that a stout, compact, and active horse, is the best for the farmer's ordinary purposes. While the heavy, over-sized horse is more easily fatigued, and slower in his movements, he requires a larger allowance of food, without yielding a proportional return in work.

The *Suffolk punch*, so called from his round punchy form, originally a cross between the Norman sire, and the Suffolk cart-mare, has been long and deservedly a favourite. The true Suffolk, like the Cleveland, is now nearly extinct. It stood from fifteen to sixteen hands, and was of a sorrel colour, large-headed, low-shouldered, and thick on the top, deep and round-chested, long-backed, high in the croup, large and strong in the quarters, full in the flanks, round in the legs, and short in the pasterns. It was the very horse to throw his whole weight into the collar, with sufficient activity to do it effectually, and hardihood to stand a long day's work. The present breed possesses many of the peculiarities and good qualities of its ancestors.

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* "The Horse."

THE SUFFOLK PUNCH.

" Their colour is mostly yellowish or sorrel, with a ratch or blaze on their faces, the head large, ears wide, muzzle coarse, fore-end low, back long, but very straight, sides flat, shoulders too far forward, hind-quarters middling, but rather high about the hips, legs round and short in the pasterns, deep-bellied, and full in the flank; here, perhaps, lies much of the merit of these horses; for we know, from observation and experience, that all deep-bellied horses carry their food long, and consequently are enabled to stand longer and harder days' works. However, certain it is that these horses do perform surprising days' works. It is well known that the Suffolk and Norfolk farmers plough more land in a day than any other people in the island; and these are the kind of horses every where used in these districts."*

The farmer who can only keep a very limited number of horses finds this breed suited to other purposes than those of the farm: the Suffolk punch will take him on his back to market, draw his whiskey, or his jaunting-car to the church or chapel on Sundays, which the heavier kinds of horse could not do with safety or comfort to him. This, to the farmer on a *small* scale, is no trifling advantage, although if he possibly can avoid it, he should never divert his team from the slow and ordinary labour of the fields, to saddle work, which spoils the pace, and in various ways injures the draught-horse. Indeed no one can be well entitled to the rank of *farmer*, who has not his family-horse, or road-hackney, besides the horses of his regular farm establishment. If, however, from his circumstances, he must occasionally unyoke his plough, or his carts, for the purpose of trotting his cattle on the roads, on business, or duty, or pleasure, it is evident that the *heavy* cart, or even *coach* horse, will not be suited to his purposes. The splutter which Obadiah's ponderous and inactive brute must have kicked up, on his mission of despatch for the midwife, and the discomfort to the rider, are very conceivable to those who have ridden on similar horses, and on similar errands.

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* Cully on Live Stock.

The *Clydesdale* breed, so called, not because they are exclusively *bred*, but from their being principally *sold* in the markets of the extensive Clydesdale district, are supposed to have originated in a cross between the Flemish horse and Lanarkshire mare. " The *Clydesdale* is larger than the Suffolk, and has a better head, a longer neck, a lighter carcass, and deeper legs, strong, hardy, pulling true, and rarely restive." A representation is here given of him.

The best and hardiest Irish draught-horses are those bred in the county of Roscommon. In general, the draught-horses used by the Irish farmer are too light for their work; from the variety of uses to which they are put by the small holders—frequent attendance at fairs, markets, funerals, and steeple-chases—with the miserable pasturage to which they are too generally doomed throughout the whole year, as well as from premature work, they are stinted in their growth and enfeebled in their frames. The Irish hunter and the Clydesdale mare have had a useful progeny; though, for regular systematic farm-labour, on a respectable scale, especially on clay soils, the thorough-bred Clydesdale, or the black cart-horse bred in the midland counties of England is far preferable.

The nature of the soil unquestionably ought to make a material difference as to the selection of a breed.

> "The heavy clay, or stiff chalky soils in parts of England cannot be worked without cattle capable of powerful exertion; here, the heavy, dead-pulling, sluggish horse, answers much better than those that are lively, mettlesome, and fast stepping. These, however, are well suited to a great part of Ireland and of North Britain, where the resistance to the plough is not often very formidable. In mountainous districts where food is usually much limited, and rarely the best in quality, but where roads are hilly and uneven, the improved Welsh breed is excellent.
>
> "It is considered by many experienced farmers, that mares are more advantageous for work than geldings, as they may be allowed to breed while kept for the plough, and need only be left perfectly idle for a short time in spring; and this system may continue until the mares attain the age of fifteen or sixteen years. Besides a mare may be valuable for breed after injuries or infirmities which render males completely worthless. The same care, however, which is observed in the selection of proper females for breeding in the case of sheep and cattle, ought to be observed here, as it is miserable economy to incur the various expenses attendant on breeding with the expectation that an ill-shaped, or ill-tempered, or worthless mare, can produce and rear a valuable progeny. Some say that if she has a good head, neck, heart, and shoulders, with a *roomy* belly, she has sufficient merits for a dam. But this is not enough; there should be an absence of all those diseases and blemishes which are hereditary, and which may naturally be expected to be transmitted from the dam to her offspring, and those good points of form and constitutional qualities, even those of temper, which it is desirable to perpetuate. 'Her dam was so before her,' is frequently the exclamation of the farmer when he finds his young mare sulky and self-willed; 'it's in the entire breed of 'em;' 'I never knew one of that blood that wasn't kind;' or the contrary. And yet, as if the order of Providence, 'that like produces like,' is to be deranged or altered at the farmer's wish, he is too often indifferent to the properties of the mare whom he designs for a breed one.
>
> "If horse breeders, possessed of good judgment, would pay the same attention to breed and shape as Mr. Bakewell did with sheep, they would probably attain their wishes in an equal degree and greatly to their advantage, whether for the collar or the road, for racing or for hunting."*

The horse selected as a sire, should be as *compact* as possible. A long, thin-legged, loosely made, and lengthy horse, is not the animal to beget foals for the farmer's purpose—nor indeed for any other; and he should be so paired with the mare, that the good points of each may be preserved, and the defects of either, in as far as they can be counteracted by opposite qualities, remedied.

Unless in cases of accidents in early life, which may disable them from active work, mares are rarely allowed to breed until they are advanced in life, and injured in constitution, when they are proportionably debilitated, and therefore unfit for the production of vigorous foals. If well used, and never injured by the excess of labour, the mare will, however, produce foals until she attains the age of twenty; and, under similarly favourable circumstances, (and if he has not been *prematurely* or too freely used as a sire,) the horse will continue fruitful until the same age. The horse should not be used as a sire until he is four years old, nor allowed to have access to the mare until she is three.

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* Parkinson on the breeding and management of live stock.

The *average* period (for there are sometimes variations of weeks beyond and short of the computed time) of gestation in the mare, is eleven months; and the male is admitted to her early in May, (when she is usually disposed to receive him,) in order that she may give birth to the foal in the beginning of April, when the season is mild, and pasturage sufficient.

During the entire time of her pregnancy she may be worked moderately and with care, even to the day previous to foaling, but ought to be fed once or twice a day with oats, even if she has been half-gone —a practice which should not be discontinued after she has foaled, if the grass be scanty. If she is designed for breeding again, she should be sent to the male on the ninth or eleventh day after her delivery, when she will not object to meet him, and again on the ninth and eighteenth day, to ascertain her pregnancy. In a month after giving birth to the foal, she may resume her light and moderate field-work, not only without injury, but with benefit to her health. The treatment of foals is thus described in the general report of Scotland:—

> "During the first winter, foals are fed on hay, with a little corn, but should not be constantly confined to the stable; for even when there is nothing to be got on the fields, it is much in their favour to be allowed exercise out of doors. A considerable proportion of succulent food, such as potatoes, carrots, and Swedish turnips (oil-cake has been recommended) should be given them through the first winter; and bean and peas meal has been advantageously substituted for oats, which, if allowed in a considerable quantity, are injurious to the thriving of the young animal, from their heating and astringent nature. Their pasture during the following summer, depends upon the circumstances of the farms on which they are reared. In the second winter they are fed in much the same manner as in the first, except that straw may be given for some months instead of hay; and in the third winter they have a greater allowance of corn, as they are frequently worked at the harrows in the ensuing spring when about three years old."

The ordinary practice is to incapacitate the males not intended for breed, at the age of twelve or eighteen months; but Mr. Parkinson recommends that emasculation should be effected at the end of the first seven days, by *twitching*, as in the case of rams at the same early age; but we do not by any means venture to recommend this practice, which occasions much lingering pain, and sometimes fatal inflammation, and must check the development of some very essential points in the form of the animal, on which much of his excellence as a draught-horse mainly depends. Temperate weather, such as is usual early in April or at the close of September, is the best for the operation, and in such weather the colt may be left at grass, moving about as his feelings may prompt; but if there be much heat or hot sun, he should be kept in house, or other perfect shelter.

When painful operations are necessary in any class of the brute creation, the least possible degree of suffering should be inflicted, and every contrivance for the alleviation of pain should be welcomed. In those needless operations which are merely the result of fashion or caprice, we cannot too strongly condemn those who either authorize or actually perform them. What excuse can be fairly offered for *nicking* the tail of a horse; for inflicting deep, and agonizing, and slowly-healing wounds, for the mere purpose of giving an unnatural, and consequently ungraceful, curvature to that beautiful appendage of the animal? We shall give no instructions to the tormentor, whom we would gladly see mutilated himself, or maimed by the *docking*[*]-knife which so cruelly and indecorously exposes altogether the hind parts of the English waggon-horse, and thus disfigures them by shortening the natural tails of three-fourths of the horses born in the British islands. The cruelty of which we complain, however, does not so much consist in merely chopping off some joints of the tail, (which, when unaccompanied by the barbarous custom of *nicking*—happily now but little practised—cannot occasion very serious pain, and may be convenient in some cases,) but in depriving the victim of a depraved taste, of the means of defending himself from the bites of the gad-fly and other summer enemies of the same kind, during many hours in the day, while he is obliged to stand, or walk slowly at field or road labour. By taking away the whisk, or fan, which Providence has given him, and leaving him the mere stump or handle instead, he is at the mercy of a stinging tribe of blood-suckers, who attack him in his defenceless quarters, while the bare, short stump that escapes the farrier's knife, is one of the most unsightly and ridiculous-looking excrescences imaginable, (we allude especially to the English waggon-horse;) and, therefore, we protest against nicking or docking agricultural horses of any kind, and decline, accordingly, to give any details of these diabolical branches of farriery.

Some farmers in England and Scotland are in the habit of purchasing yearlings, and two-year-olds, from the breeders, and turning them among their grazing stock until they are old enough for training, and working gradually; at the age of five they sell them at a considerable profit, having had their labour for the previous years for their keep. Many of the Berwickshire, Roxburghshire, and Lothian farmers, (as appears from the General Report of Scotland,) purchase colts and fillies from two-and-a-half to three-and-a-half years old, at fairs in the west of North Britain, in October, and sell an equal number of their full-grown and trained horses when at their highest value, and by this system keep up their flock without any loss except what may arise from contingencies.

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[*] Supposing for a moment that men were born with tails, as a celebrated peer believed some species of the human family to have been.

TRAINING.—The sooner that horses are handled gently the better; indeed from the time of weaning they should be accustomed to bear a halter, and be familiar with man, else it will be difficult to reduce them to necessary discipline afterwards.

The trainer should in a considerable degree be possessed of good sense and good temper, else the horse is too often ruined, and led, in supposed self-defence, to acquire what are miscalled vicious tricks, in consequence of having been under the hands of an ignorant, unreasonable, passionate, or cruel brute, in the shape of a man.

Kicking, for instance, may be occasioned by some part of the tackle hurting or tickling the horse. From mere stupidity in a plough-boy or carter, the poor brute may be unjustly accused of being restive or vicious, and ill-treated without reason. It does not often happen that a horse is really and naturally vicious; he is generally rendered so by bad treatment and despair. Resistance on his part is often merely the result of high animal spirit, and the consciousness of strength; and if he is treated as an animal of high and delicate sensibilities ought to be, he may be rendered as tractable as a dog.

The mode of training horses for agricultural purposes is admirably, and in the true spirit of benevolence, thus fully detailed in the treatise on the horse already referred to:—

> "Having become a little tractable, portions of the harness may be put upon him, and, last of all, the blind winkers; and in a few days afterwards he may go into the team. It would be better if there could be one before and one behind him, beside the shaft-horse. Let there be first, the mere empty waggon. Let nothing be done to him, except that he may have on occasional pat or kind word. The other horses will keep him moving, and in his place; and no great time will pass, sometimes not even the first day, before he will begin to pull with the rest; then the load may be gradually increased."

The agricultural horse is wanted to bear a rider as well as to draw.

Let his first lesson be given when he is in the team. Let his feeder, if possible, be first put upon him; he will be too much hampered by his harness, and by the other horses, to make much resistance; and, in the majority of cases, will quietly and at once submit. We need scarcely add that no whip or spur should be used in giving the first lessons when training for the saddle.

When he begins a little to understand his business, backing, the most difficult part of his work, may be taught him; first, to back well without any thing behind him; then with a light cart; and afterwards with some heavier load, and taking the greatest care not seriously to hurt the mouth. If the first lesson causes much soreness of the gums, the colt will not readily submit to a second. If he has been rendered tractable before, by kind usage, time and patience will do all that can be wished. Some carters are in the habit of blinding the colt when teaching him to back; it may be necessary with the restive and obstinate one, but should be used only as a last resort.

The colt having been thus partially broken in, the necessity of implicit obedience may be taught him, and that not by severity, but by firmness and steadiness; the voice will go a great way, but the whip or the spur is sometimes indispensable; not so cruelly applied as to excite the animal to resistance, but to convince him that we have the power to enforce submission. Few, we would say *no* horses, are naturally vicious.

It is cruel usage which has first provoked resistance; that resistance has been followed by greater severity, and the stubbornness of the animal has increased; open warfare has ensued, in which the man seldom gains an advantage, and the horse is frequently rendered unserviceable. Correction may, or must, be used, to enforce implicit obedience, after the education has proceeded to a certain extent; but the early lessons should be inculcated with kindness alone. Young colts are sometimes very perverse; many days will occasionally pass before they will permit the bridle to be put on, or the saddle to be worn; one act of harshness will double or treble this time. Patience and kindness will, after a while, prevail. On some morning when he is of better humour than usual, the bridle will be put on, and the saddle will be worn out; and this compliance being followed by kindness and soothing on the part of the breaker, and no inconvenience or pain being suffered by the animal, all resistance will be at an end.*

One of the safest modes of training a horse to draught, is by attaching, in the first instance, a very light weight on the ground to long ropes from the collar, and *coaxing* him to drag it along; or by directing two or three strong men at the extremities of the ropes, to pull them steadily and continually, if the horse will take them kindly in tow; and, if not, to pull them and relax alternately and gradually, in such a way as to yield to the horse when resistance may tend to render him sulky, and to urge their weight in opposition to his draught, when they find him inclined to draw. Exceeding care should be taken in the commencement of his education for the collar-work, not to alarm the young horse, or give him bad habits, which he so readily acquires, and which often become incorrigible. Severity of discipline should always be avoided.

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* "The Horse."

In many cases the most harmless ebullitions of animal spirits are sometimes improperly punished by brutal horse-tenders, as if they were vices. If a horse slips his collar, and runs about a field in the enjoyment of unwonted liberty, the angry stable-man, after fretting himself into a rage in the first unsuccessful efforts to catch the horse, having at length treacherously tempted the playful animal to allow himself to be caught, kicks and flogs (and of course curses) him when he has him in the stable, the surest mode of inducing him to remain longer in his gambols on the next occasion, and to avoid his tyrant—and all this because the man is in a towering passion, which he ought in justice to vent upon himself for having negligently let the horse slip from his hands.* A ploughman or carter should guide his horses, as much as may be, by *language*, and not by reins or whip; and, therefore, should not be removed from his attendance on the same horses, to other employments, it being of quite as much importance that the horse should know the attendant, as that the latter should thoroughly acquaint himself with the temper, power, and general properties of the animal he has to manage.

A constitutional tendency to vice sometimes, however, does exist; and where vices or troublesome habits become inveterate, precautions against accidents cannot be too carefully used. For guarding against the teeth of a biting horse in his stall, Mr. Stewart† gives a simple contrivance, represented in a plate, for drawing up his head by a rope and pulley when he wants to approach his head.

FEEDING.—Mangers, or boxes without any racks, are now generally adopted from motives of economy, and regard to the natural posture of the horse when feeding; straining his neck upwards for every mouthful of hay, is contrary to the free inflections of his neck when in his unrestrained state at pasture. Besides, much of the hay is pulled out of the rack to be trodden under foot. In the close box every wisp is preserved, and though the horse may at first select only the choice bits, (unless exceedingly hungry,) he will afterwards, if his allowance be properly limited, eat every part of it that is not positively bad. Chopped hay and straw can be mixed in these boxes with oats and beans, without the loss of a single particle.

The quantity of hay *wasted* in Ireland, in the stables of the gentry and wealthy farmers, is immense. Their mode of feeding with hay is uneconomical in itself, and injurious to the condition of the horse, who is stuffed with it, but stinted in oats, and rarely supplied with beans. Many persons who spare no expense in providing oats and beans for their horses of mere show and amusement, grudge a sufficiency of oats to the poor brutes condemned to the cart and plough. Mr. Stewart thus expresses himself in treating of the deficiency of food:—

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* See "The Horse."

† Stable Economy.

> "When the owner can afford to feed his horse, he generally allows him sufficient. He soon discovers that the work cannot be done without it. He may grudge the cost of keeping, but he soon finds that it is easier to buy food than to buy horses. Starvation and hard work quickly wear them out. Though nobody who can avoid it will starve working-horses, yet many think it no sin to starve idle horses. Colts, before they come into use, and horses thrown out of work by lameness, or other causes, are often very ill fed, or rather, they are not fed at all. The privations of a farmer's stock, during winter, may not in every case be avoidable, and, when they cannot be cured, they must be endured. But the allowance of food is often reduced too much; not because there is little to give, but because it is thought unnecessary or wasteful to give more.
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> "Both young and old horses suffer much more mischief from want of sufficient food than is generally supposed. The young, however, suffer most. Starvation checks the growth and destroys the shape. Horses that have been ill-fed when young, are almost invariably small, long-legged, light-carcassed, and narrow-chested."*

The opposite error, of excess in food, is rarely committed, systematically at least, with the mere farm-horse; and if it should be his lot to have too liberal an allowance of the luxuries of the stable, he does not suffer at his slow and regular work as a more generous description of horse might; he may be fat and yet work at the same time.

The small farmers of Ireland seldom give oats (and never any beans) to their miserable horses, who are turned on bad pasture in summer, with clover occasionally, when their land happens to be under better management. In winter, and the severe periods of spring, they supply only bad hay, or more frequently pounded furze, the refuse of potatoes, and some straw, with a run in the fields by day at idle hours. But it is better to state what a horse ought to have, than what he has not. Let us, however, first consider the peculiar organization of the horse's stomach. "Of all animals, he has the smallest stomach relatively to his size."† "The camel has cells in his stomach, store rooms for his food during many days of abstinence. Thirty sacs have been reckoned in the dromedary's stomach."‡ But the interior department of the horse has no spare room whatever; and after slow or moderate work he returns to his food with appetite, which shows that digestion and its consequences had rapidly proceeded, and it is the smallness of the stomach which causes the almost unintermitted process of digestion.

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* Stable Economy, p. 274.

† Paley's Natural Theology, illustrated by Lord Brougham and Sir Charles Bell.

‡ Ibidem.

A large horse will, of course, require a larger allowance of food than a small one.

We shall give some of the proportions used under the best modern management.

In the vast establishment of Messrs. Wiggins, in London, in which three hundred huge cart-horses are kept, each horse has this daily allowance, viz.:—18lbs. of corn; 16lbs. of hay; 4lbs. of straw; 2lbs. of hay—total, 40lbs.

For some of the horses 33 or 36lbs. of this mixture is considered sufficient. Under the head of corn are included oats, barley, beans, peas, and bran. The fodder is all cut into chaff.* In other great brewing establishments in London, the allowance is not more than 36lbs. for any of the horses, and this is not cooked.

The cart-horses of Mr. John Brown of Glasgow have their food at night boiled; and this consists of beans, barley, and hay-seeds, which are given warm. Though the fodder is not limited, few of them consume more than 16lbs. These horses are out from ten to twelve hours at intervals per day, carting goods, and are never fed when out. The draught imposed on these fine horses does not exceed twenty-five cwts.†

In Flanders, the treatment of the farm-horses, which greatly resemble the Suffolk-punch, is proverbially excellent; in some districts there, his allowance in winter is about 6 quarts of oats and 2½st. of hay, or 73lbs. of carrots with 1½ st. of hay, and 6 quarts of oats. In summer he has about 80lbs. of clover, with 6 quarts of oats, or 2 quarts of beans instead. In the district of *Cadsand* "the keep of the horse, from the middle of November to the middle of February, for the 24 hours, consists of 3lbs. of beans, 30lbs. of bean straw, and 20lbs. of wheaten or barley straw, cut, (with a chaff-cutter precisely like ours;) or, in lieu of these 20lbs. a similar quantity of clover-hay, cut; but this latter is by no means a necessary indulgence.‡ From the middle of February to the middle of May, each horse has 8lbs. of beans, 20lbs. of bean-straw, 20lbs. of barley-straw, and the chaff of the wheat. During the summer, about half an English acre of meadow, cut and carried to the stable, is counted sufficient for one horse; and from the middle of May to the middle of June, when in its full sap, it is unassisted by any other kind of food; but from the middle of June to the middle of September, about one-sixth part of an English acre of clover is added, with 2lbs. of beans a day; and from the middle of September to the middle of November, each horse has about one eighth of an acre of carrots, the tops of which are given to the cows."

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* See Quarterly Journal of Agriculture. † Stewart's Stable Economy.

‡ Radcliff's Report of Flanders.

This is certainly a very abundant dietary, besides which the horses receive additional nourishment from a very liberal allowance of *white soup* given to them as their first dinner and supper *course*, which is composed of water well thickened with bean-meal, or enriched with oil-cake; but without the degree of fatness which it occasions, the Flemish farmer would not be satisfied; and the horses, notwithstanding this pampering, are surprisingly docile and gentle, and are guided (sometimes three of them abreast*) by a single rein, attached to the near side horse, which the ploughman holds in one hand, while he guides his one-handled plough with the other.

Many teams of horses in England and Scotland are without any hay whatever during some parts of the winter months, and yet are in good condition, from the abundant supply of oats, chaff, beans, grains, Swedish turnips, or steamed potatoes. If hay can be procured on moderate terms, it is certainly most desirable that they should have 10lbs. or 12lbs. of it per day, but not more; and where hay is not available, bean haulms steamed are good and sufficient substitutes. It is no trifling consideration to the farmer (and practical observation has proved it) that his horses may be kept in the highest order without either hay or oats, which he may send to market, provided he supplies freely the various other substitutes which may be raised on a comparatively small portion of his land. Let these be *comfortably served up* to the animals, and let them be fed with the utmost regularity, on which a great deal more depends than is generally supposed. In proof of this we would adduce the condition of our cavalry horses, which are allowed only 12lbs. of oats, and 12lbs. of hay, and 6lbs. of straw, (for bedding, of which, however, they generally eat a good part,) without any alterations, except bran occasionally. They are fed with *extreme* punctuality, exercised regularly and moderately, and groomed with exceeding care, for without this systematic exercise and grooming the quantity of food would be inadequate to the support of their high state of health and spirits. When horses have large quantities of hay thrust into their racks or mangers, without that kind of food which can be quickly eaten, and will soon satisfy the stomach, they stand during the greater part of the night to fill themselves, instead of lying down to rest. If the allowance of hay or straw be cut into chaff and mixed with corn, the horse will eat a sufficiency of food in an hour-and-half, and can repose for many hours.

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* This is in very deep and stiff soils; in light soils one of these horses is sufficient for a plough.

On the whole, we are disposed to recommend for the winter food of farm-horses of ordinary size, where hay is not abundant, the following dietary, as suggested in the Quarterly Journal of Agriculture :*

"In the morning—3½lbs. oat and bean meal; 11½lbs. chopped straw. Total 15lbs.

"At mid-day—3lbs. oat and bean meal; 12lbs. chopped straw. Total, 15lbs.

"And at night—1½lb. oat and bean meal; 2lbs. chopped straw; 11½lbs. steamed potatoes. Total, 15lbs.

"With variations of 2 stone of Swedish turnips and bean-stalks, and hay when procurable, giving a decided preference to good hay, of which 14lbs. will be sufficient in the course of 24 hours, with 6lbs. of straw cut into chaff. For summer feeding, soiling on clover, lucerne, &c. &c., with 6lbs. of oats, is the best treatment; and in no avoidable cases should pasturing be adopted, except when sick horses require it. Accidents frequently happen when horses are loose together, and there is a woeful loss in manure, and in economy of land, by this practice.

"Sheaf oats, if not too new, cut into chaff, is excellent, and saves the trouble of threshing, though in some respects this mode of sheaf-feeding is wasteful. Steamed potatoes, turnips, &c. sprinkled over with salt at night, are both palatable and nutritious, but *new* oats are extremely unwholesome, being indigestible and purgative; no farmer who can afford to keep over his stacks, will give his horses oats less than a year old, and the same rule should be observed with beans. Barley well boiled is also an excellent food for horses at night; 4lbs. of this, from its expansion by boiling, is a sufficient allowance, and it tends more than any other food to make a horse sleek and fat. The water in which the grain has been boiled is very nourishing, and powerfully remedial in case of coughs. Horses eat raw barley with apparent disrelish; but when malted they take it with avidity, and it is probably a nutritive and wholesome food in small quantities. Bruised furze are used by many farmers, especially the small holders in mountain districts, with great advantage; a very small portion of oats, with a *little* hay or straw added to furze, will support a horse in high working order."

Mr. Tytler of Berwickshire, as appears from the Transactions of the Highland Society, fed his farm-horses principally on bruised furze and straw for five years, from the 1st November to the middle of March, without any oats except from the beginning of February. During the first period the cost of feeding each horse was 4¾d.; and in the second period, when 3lbs. of oats were given, the daily expense did not exceed 6d. per horse. We are advocates for oats, and beans too, in some proportion, notwithstanding. See *Furze.*

* No 21.

The hay ordinarily produced in Scotland is rye-grass and clover mixed; but in England clover-hay is very common, and for farm-horses this, if well saved, is the best, and certainly the strongest. In estimating the quantity of hay, or the relative properties and proportions of hay and straw, it is obvious that the qualities of each should be estimated. Good straw is better than bad hay, but good hay is infinitely better than any straw, which yields little *nutriment*. When cut in chaff it divides the oats, and obliges the horses to chew them, fills the stomach, and in this way is salutary. No bulk of straw alone would support a horse for work. Swedish turnips are becoming very general for horses; they are much better boiled or steamed than raw, and with straw, and a little oats, will keep them in high condition. Field carrots are very rarely used or known in Ireland; yet they are very nutritive, and are much relished by the horse, (after a little familiarity with their flavour,) who may be much limited in his allowance of oats, when they are given to him.

TREATMENT IN THE STABLE.—Nothing conduces more to the health of this serviceable animal than habitual cleanliness and good rubbing with a wisp or brush; if a horse be fed ever so well, and yet neglected in the stable management, especially after work, or much exposure to rain, he may contract a variety of diseases. He should be regularly rubbed (not more with the curry-comb than is sufficient to remove all roughness and indurated filth from the hair) with a wisp lightly bound up, and with a heavy yet active hand, for the friction circulates the blood and opens the pores of the skin, promoting that insensible perspiration which should never be checked. Neither should the brush be spared afterwards. This dressing should be given at least twice a day. The luxurious care bestowed on the high-mettled hunter is neither suited to, nor required for the *humbler* farm drudge, who can preserve his condition and health very well without much bustle of personal attendance, and certainly without the warm bath* large enough for him to swim in, which has been added to at least one great hunting establishment in England. But the importance of a reasonable degree of attention even to the grooming of the cart-horse cannot be too strongly urged. Boys are often allowed to ride the horses, on return from work in the evening, into water, even to their bellies, when the certainty is, that the legs will not be rubbed dry immediately afterwards, and the want of this rubbing often causes cracked heels, and ultimately grease, ay, and *grapes*† too, as the *fruits* of negligence.

The breeds of heavy draught-horses, and indeed of all those designed to rough it through life in climates not remarkable for atmospheric dryness or warmth, have their legs cased naturally in long hair, which ought not to be trimmed. The provision which has been wisely made for protecting the heels from cold and damp, shows the importance of keeping the legs dry and warm. With horses kept more for show and amusement, a more fastidious grooming renders this shaggy coating unnecessary, and even inconvenient. The legs of the well-kept hunter, roadster, or carriage-horse, are well rubbed and dried as soon as washed. Nature would almost appear to have anticipated such careful treatment, for we see the high-bred horse with little or no long hair growing on his legs and fetlocks. But the steed of less gentle blood, who has no ready and active attendant, or "groom of the stole" at his toilet, after labour, is benevolently furnished with a pair of hairy boots, to prevent chilliness in his heels, by the sudden evaporation of heat, which, according to Mr. Stewart, and the able compiler of "The Horse," is one of the principal causes of cracks and grease in those extremities. Moisture not removed by good rubbing will cause these disorders, and on this account it is concluded that, in the case of horses exposed to the neglect of servants, it is better, as a general rule, not to wash the legs at all; but though the legs thus protected do indeed absorb "a great deal of water, and remain wet for a much longer time than those which are nearly naked, they never become so soon or so intensely cold; evaporation cannot proceed so rapidly; the vapour lingers among the hair, and cannot escape all at once; if these horses had naked heels there would be little difficulty in drying them, but the little trouble it requires is too much."*

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* Sporting Magazine, No. 102.

† A cluster of ulcers.

This veterinarian states, in proof of his assertion, that out of 300 coach and post, and 150 cart-horses, cases of grease most frequently occurred where the horses were both trimmed and washed; were common when they were trimmed, but not washed; and *very rare* among those which were neither washed nor trimmed. It would appear that, in this respect, as in many other particulars, the constitution of the horse resembles that of the human animal, for the same caution is applicable to both. "Take care of the feet, and the body will take care of itself." So essential is it that warmth should be preserved, either by the natural powers of the constitution, or by the artificial excitement of friction and warm clothing, and that the skin should be guarded from the action of cold moisture, with constant care. The heels of horses regularly worked at the plough, will not, generally speaking, contract grease, or even cracks, being saved from them by the antiseptic properties of the adhesive earth.

PHYSICKING.—The management of horses in physic is not so simple as most people imagine, as is proved by the number of deaths which occur every year from *inflammation* and injudicious treatment, and not from the mysterious causes so *readily assigned* by the ignorant stable-man, or careless hedge-farrier of the neighbourhood.

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* Stewart's Stable Economy.

On coming into stable from a summer's run at grass, the transition from the open and cool air, to that of a confined room, and from grass to hard food, renders it necessary, in many cases, to give two or three very moderate doses of physic, to *prevent* inflammation, and obviate the other dangers resulting from a sudden change; but with the healthy farm-horse this precaution is rarely necessary, particularly if his green food be not too suddenly withdrawn, and bran mashes be given for some time after coming in from grass. His work is of a moderate kind, requiring no particular precautions to be observed, and his daily exposure to the external air, for eight or ten hours, prevents him from experiencing any bad effects from his domestication at night in the well-regulated atmosphere of his stable. If the owner, however, approves of physicking—which on the whole does horses more harm than good, from the bad composition of purgatives, and the injudicious treatment of the horse while under their influence—let the horse be well prepared by bran mashes until *the contents of the bowels are completely softened*, which is a most essential precaution, the importance of which appears from the fact, that horses are almost never known to die when physicked on grass, when the bowels are perfectly open; the free state of the entire length of the intestinal canal allows the uninterrupted and equal diffusion of the purgative matter without causing any partial stimulus to take place, which often occasions griping, inflammation, and death. Give him only 5 or 7 drachms, at the most, of *Barbadoes* aloes, or from a scruple to half a drachm of Croton, in a ball with meal. This last medicine, though it does not create nausea, is apt to occasion watery* stools, and is, therefore, debilitating. Mr. Peall, an excellent veterinarian, objects to the Barbadoes aloes on account of their griping and nauseating qualities, and prefers the socotorine or Cape aloes, on account of their mildness. He allows, however, that the Barbadoes are more active and certain, which, with impatient or ignorant grooms who would neither properly prepare the horse for the other kinds, nor patiently bring about their operation by gentle exercise at intervals, may be desirable. He recommends cream of tartar with the former aloes, and injections of four quarts of thin gruel, with two table-spoonsful of salt, every two hours, in all cases in which physic does not operate, and the belly swells. Sometimes the aloetic purge acts on the kidneys, and will be known by the deep aloetic colour of the urine, and be serviceable, in this way, though the farrier may not perceive its operations. Many veterinarians say that the horse should not be taken out to exercise,* by way of *working off* the medicine, as is so generally done on the day on which it operates, as the exercise may produce cold or inflammation, but that he should be rode gently during the time of preparation. While in physic let him have abundance of oatmeal barley, or bran water, with the extreme cold, at least, taken off, if he will not drink it warm.

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* See "The Horse."

Summer is an improper season for giving physic, as inflammation, if excited in the alimentary canal by the medicine, would advance so much more rapidly than in cool weather. This inflammation is, in fact, the cause of death, when it occurs in physic, and not *exhaustion* from the action of the physic, as so many believe to be the case. Aloes, which are the principal ingredients in the purgative ball, have always a tendency to produce inflammation in the intestines, particularly when the heat of the weather assists in debilitating the tone of the organs acted upon, and renders them less able to withstand its influence.

There should be at least a week between each dose, to allow the animal to recover from the temporary debility occasioned by the purging, and one or two doses, in all *ordinary* cases, will be found sufficient, notwithstanding the vulgar prejudice in favour of three—"the first to stir up the humours, the second to set them afloat, and the third to carry them off."

Diseases.—As we have no intention of unnecessarily invading on the veterinarian's province, we shall merely advert slightly to a few of the commonest complaints of the horse, which do not require any surgical aid, and which are sometimes dealt with in a very bungling manner.

Colds.—In a healthy state of the body, there is a fine fluid constantly escaping, like steam from hot water, from the pores of the skin. If these be closed by chilling currents of air after very heating exercise, or close confinement in warm stables, the perspirable matter is thrown in, from want of its natural escape, upon the blood, overfilling the vessels, and affecting different parts of the body, according to the predisposition of certain organs; for instance, if the *nervous* system be most sensitive, the repulsion of the fluid, which ought to be discharged at the surface of the skin, may affect the eyes; if the *glandular*, the neck, throat, and jaws will be attacked; and, if the *whole circulation* be morbidly disposed, the lungs will become disordered. A symptomatic fever usually attends colds, and, therefore, according to the symptoms and condition of the horse, blood should be taken; mashes of bran should be substituted for oats, with 1oz. of aniseed, and 1oz. of licorice in the morning and night feeds. Common coughs will readily give way under this treatment; but those which are asthmatic, or the forerunners of broken wind—husky hollow wheezings, as if particles of hay or oats stuck in the throat—are incurable. An asthmatic, or a thick or broken-winded horse, will perform slow farm-work, and be *relieved* by the use of green, succulent food, in limited quantities, bran and carrots especially, which are nutritious and digestible. He should have *very* little hay, or straw, or any bulk of fodder which would occasion pressure on the lungs; but he cannot be cured. His allowance of water before work should be very limited, but after it he should have enough, and if he be fed upon moist food, he will require but little. The cough of a broken-winded horse, or of one becoming so, is well known—dry, obstinate, and sharp—coming on by fits, and accompanied with a double heaving of the flanks, and with moans which indicate the pain he suffers in discharging the air from the ruptured cells of his lungs. When a slow working-horse becomes broken-winded, there can be little doubt of its proceeding from over-filling of the stomach with bulky food, especially after long fasting, and strong exertion in draught. It need hardly be added, that a free circulation of air is necessary in this case, but turning out to grass will be of no service, as the stomach, in such case, is in a constant state of distension.

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* Many good grooms, however, persist in walking the horse about to assist the operation of the medicine.

Strangles.—This, which begins with a cough, rarely attacks horses before the fourth, or after the fifth year, between which periods it is of almost certain occurrence. Like the hooping-cough, small-pox, and measles, in the human species, it does not affect the constitution twice.

It appears generally in spring. The symptoms, besides cough, are a discharge of thick and yellowish mucus without smell from the nostrils, and a swelling under the throat, which increases and occasions pain and difficulty in chewing and swallowing, so that the sufferer cannot drink, however thirsty, and, unless relieved by the suppuration of the swelling, is the victim of strangulation. In order to hasten the progress, and mitigate the virulence of the disease, a blister is the most effectual agent, and should be applied as soon as the tumour appears. This will tend to allay inflammation and cough, and mature the suppurating tumour, which should be lanced deeply when ripe. To accelerate the dispersion of the humours, and heal the wound, spunging with warm milk and water, and an injection of friar's balsam, is good. Bleeding, which would put back the progress of suppuration, should only be performed when respiration is much impeded, and the fever high. But these symptoms rarely accompany the disorder, if it be promptly and properly grappled with; one or two *mild* aperients should be given subsequently, and green food is *best*, both as acting on the bowels and inducing the patient to resume food, in consequence of its being easily masticated.

Fevers.—The most striking symptoms are dulness and motionlessness of the head, a great swelling of the eyes, and quickness of the breath, which is also hot; the body feels burning, and the horse stretches out his limbs and seems indifferent to strokes; in moving he seems every moment about to stumble; his body shivers; he grinds his teeth, and his excrement is hard. Yet, as he may droop his head, and tremble from the effects of fatigue, it may be prudent to try if he will taste corn, (a horse in a fever loathes food,) for if he eats, it is probable, that he has not real fever, but is *oppressed* from over-exertion, which, however, is generally the *cause* of fever, though this sometimes proceeds from indigestion, bad air, or excessive heat. Soft litter, and a warm mash of gruel, with porter or spirits in it, and bathing the loins and back with warm water (provided that they are rubbed perfectly dry and warm with the hand afterwards) will greatly tend to his recovery.

Bleeding from the neck, and injections, are the best remedies. If the attack be in winter the patient should be clothed, and kept in a temperately warm stable; and if in summer, as soon as he becomes convalescent, he should be moderately fed on vetches, &c., and afterwards sent to grass.

Milk and raw eggs have been recommended by old writers in those cases which arise from mere exhaustion and fatigue; every thing of a renovating nature, if it does not irritate the intestines, must certainly be good.

There are distinct classes of fever, various both in their causes and duration.

A mild fever, or effervescence of the blood originating from rapid and severe work, thirst, abuse, falls, wounds, obstructions in the perspiration, &c., may last but a day or two; others are of longer duration. *Rest* will assuage that which arises from excessive toil; *refreshing* food, judiciously administered, will remove that which arises from hunger; and *drink* will be the best remedy for that which has its origin in thirst.

Tertian fever commences with shivering, and ends in sweating; the paroxysm of a true tertian fever will subside in twelve hours.

The quartan fever is that which principally attacks horses fed with coarse and indigestible aliment; when this is the case, a change of diet is indispensable; but in all cases of true fever, besides bleeding about the neck or head, the bowels must be kept free by injections.

Glanders.—This terribly infectious and incurable disease, with its causes, is very ably and interestingly described in "The Horse." We can only refer slightly to it. The details, however, are the less necessary, as it is only important to ascertain the existence of the malady; for, when this is once decided, it only remains to administer briskly a dose of lead, with a due admixture of a certain explosive and carbonate powder, the combined operation of which quickly and *permanently* relieves the sufferer. In fewer words, and joking apart, let the horse be shot without delay.

The disease is justly conjectured to originate in the polluted atmosphere of dirty, ill-ventilated stables, or any very close and impure air. A remarkable instance of this is given in Percival's lectures on the veterinary art—"In the expedition to Quiberon, the horses had not been long on board the transports before it became necessary to shut down the hatchways, (for a few hours only;) the consequence of this was, that some of them were suffocated, and that all the rest were disembarked either glandered or farcied."

It appears that glanders and farcy are different modifications of the same disease.

In glanders, the seat of the disorder is in the pituitous membrane of the nose, by which a humour filtrates into the nostrils, where it is discharged; and, strange to say, when only one nostril is attacked, in a vast majority of cases, it is the left. A French veterinarian states, that, "out of eight hundred cases of glanders that came under his notice, only one was affected in the right nostril."

The membrane of the nose is extremely sensitive, and easily affected by the pungent and acrid gases generated by the dung, and *urine* especially, in foul and ill-ventilated stables, where the infection is so frequently concentrated. Horses in well-aired and clean stables do not contract it, unless from contact with a glandered horse accidentally brought there, nor do they take it at pasture, unless by contagion. Horses in a state of nature are not affected by it; free circulation of pure air is a certain preventive. It is one of the consequences of domestication — of confinement in dirty, close, and ill-constructed stables, where noxious gases, irritating the sensitive organ, where it appears in the form of a wasting humour, are perpetually floating in very limited space. It may be caused by an injury to the nose, or from inflammation of the pituitous membrane, occasioned by sudden cold.

This disease is known to be highly infectious, and, though not communicable by the mere breath, the noxious matter from the nostrils must actually come in contact* with the same delicate organ of the previously uninfected horse, either from being blown upon him by the sneezing and snorting of the other, or by having been deposited on the rack, or manger, or water-bucket.

The question whether glanders is or is not capable of being communicated from the horse to man, has been much discussed on the continent. Among authors in this country, however, there appears to be little doubt that the disease is highly infectious, many cases having occurred in consequence of the matter from the nose of the animal having come in contact with an open wound, or some other unprotected surface. Dr. Elliotson was probably the first to call the attention of medical men to this subject in this country; his paper is in the 16th vol. of the Medico-Chirurgical Transactions.

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* The matter of glanders or farcy will produce these diseases in one or other of the forms, by *inoculation*, as experimentalists have proved.

Seven different kinds of glanders have been enumerated and distinguished by old writers on farriery, but those are probably only different stages of the disease, or, in one or two cases, simple strangles or catarrh. It is important to distinguish between real glanders, which are incurable, and the other two affections which have been sometimes mistaken for this malady.

" Glanders have often been confounded with *strangles*, and by those who ought to have known better. Strangles are peculiar to young horses. The early stage resembles common cold, with some degree of fever and sore throat; generally with distressing cough, or at least frequent wheezing, and when the enlargement appears beneath the jaw, it is not a single small gland, but a swelling of the whole of the substances between the jaws, growing harder towards the middle, and after a while appearing to contain a fluid, and breaking. In strangles the membrane of the nose will be intensely red, and the discharge from the nose profuse, and purulent, or mixed with matter almost from the first, and when the tumour has burst, the fever will abate, and the horse will speedily get well.

" Should the discharge from the nose continue for a considerable time after the horse has recovered from strangles, as it sometimes does, there is no cause for fear; simple strangles need never degenerate into glanders. Good keep, and small doses of the blue vitriol given internally, will gradually make all right.

" Glanders have been confounded with catarrh or cold, but the distinction between them is plain enough; fever accompanies cold, and loss of appetite, and sore throat, (the quidding of the food and gulping of the water are sufficient indications of the latter of these;) the discharge from the nose is profuse, and perhaps purulent; and the glands under the jaw, if swelled, are moveable, and there is a thickening around them, and they are tender and hot. With proper treatment the fever abates, the cough disappears, the swellings under the throat subside, and the discharge from the nose gradually ceases, or, if it remain, it is usually very different from that which characterizes glanders. In glanders, there is seldom cough of any consequence, and generally no cough at all.

" A running from the nose, small in quantity, and from the smallness of its quantity drying about the edges of the nostril, and so presenting some appearance of stickiness, will, in a few cases, remain after severe catarrh, and especially after the influenza of spring; and these have gradually assumed the character of glanders, and more particularly when they have been accompanied by enlarged glands and ulcerations in the nose. Here the aid of a judicious veterinary surgeon is indispensable; and he perhaps will experience considerable difficulty in deciding the case. One circumstance will principally guide him:—no disease will run on to glanders which has not, to a considerable and palpable degree, impaired and broken down the constitution, and *every disease that does this will run on to glanders.* He will look then to the general state and condition of the horse, as well as to the situation of the glands, the nature of the discharge, and character of the ulceration."*

The distinction made by the celebrated veterinarian La Fosse, was, that in order to constitute true glanders, the pituitous membrane should be inflamed, ulcerated, and chancred, that the glands of the lower jaw should be swelled, and that there should be a discharge for about a month. If the above characteristics be absent, and *especially* if the pituitous membrane be not inflamed, the horse is not to be considered glandered, although malignant strangles, or glanders improperly so called, may terminate in glanders; consumptive glanders may, according to the same authority, degenerate into real glanders.

It would appear on the whole, that there are two species of glanders, distinguished according to their causes, one arising from an exterior cause—suppose acrimonious gases, or a stroke—acting on the pituitous membrane, (which is seated in the partition that divides the nostrils;) the other from some *pre-existing disease*, which, by bringing on a discharge from the nose, occasions corruption in the pituitous membrane. The first of these is the least dangerous; vapours and dissolvents *may* do good in the local case, if they reach the seat of the disease; but if this be beyond their agency, (and the spenoid sinus, if *it* be affected, is beyond the reach of any application,) there is no chance of effecting a cure. The irritating humour always flowing inflames the membrane, and will perpetuate the disease in spite of all remedies; the humour feeds the disease or produces it again, should it subsist no longer; and in confirmed *constitutional* glanders, besides the local applications to the nostril, it is necessary (but, alas! impossible) to dry up the humour in the system before it reaches the outlet, and that it may no farther affect the membrane in the head. While it appears that the kind of glanders which affects the pituitous membrane only, is not absolutely incurable, it is certain that the other, which is in the *system*, and affects the lungs and viscera, is mortal.

It is curious to remark, even in the details of a matter of mere common fact, the difference of judgment. Experiments have been made by some of the French academicians to ascertain if certain glandered horses, killed at different stages of the disease, and dissected for examination, were or were not diseased in the viscera. As if to confirm the adage, "who shall decide when doctors disagree," the veterinarians present differed as to the seat and cause of the disease, and drew the most contradictory deductions. One point, however, was indisputable, viz.

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* "The Horse."

that certain parts of the body were more or less affected according to the different stages of the disease. In the commencement, the indications were strictly confined to the pituitous membrane, by which the humour filtrated into the nostril from which it issued. When the disease had advanced to the last stage, it appeared not only in many parts of the head, lungs, and liver, but was also indicated on all parts of the body, which it rendered a mass of corruption. Horses have, no doubt, been cured, when glanders have been merely local; suppurative remedies and setons in holes bored at the side of the head, and dissolvents by way of vapour may, possibly, in recent affections arising from the *exterior* causes already enumerated, be removed; but they are assuredly useless when the disease arises from constitutional taint or debility.

A glandered horse may live, it is true, for a considerable time, but unless his owner keeps an entire establishment of glandered horses, or has but one—and that one carefully secluded from all intercourse with his fellows—at home or abroad—his wisest plan is to get rid of *him at once*, and to wash the rack and manger perfectly with soap and water, and a solution of chloride of lime, (one pint of the chloride to a pailful of water,) "and paint the buckets, and white-wash the walls, and burn the head-gear."

Farcy — we mean what is termed the true farcy — though very different in its appearance from glanders, is of the same nature—rather a different stage of the same disease. "They will run into each other, or their symptoms will mingle together; and before either arrives at its fatal termination, its associate will almost invariably appear." "The matter of glanders will frequently produce farcy,"* which proceeds from the same or similar causes, bad air, foul feeding, ill treatment, and infection; but farcy differs in one essential particular, namely, in being curable, except in its last and desperate stages.

The *buttons* or *buds* which appear in the skin (from inflammation caused by the poisonous matter which certain absorbent vessels take up) are tumours, usually painful when touched, and hard at first, though they soon become soft and blistered, and discharge a thin, watery humour like serum, which afterwards becomes thick, and even bloody, and ulcerates at last, terminating in the loathsome form of *glanders*. The absorbent vessels just referred to, by the agency of which the disorder is brought to exhibit tumours, which are often the first indications of the farcy, are tubes which contain valves like those of the pump, and prevent the return to the surface of the noxious fluid which they suck up. "The inflammation which pursues the natural course of the fluid through these tubes, that is, towards the reservoir in which it is thrown, before it enters the heart, seems to be arrested by these valves, and they inflame and swell."* Hence arise the little round tumours, called buttons or buds, springing out over the veins, along the course of which a corded appearance is perceptible. In some cases the tumours appear on the head only, in others on the outward jugular; sometimes on the plate-vein running downwards on the inside of the fore-arm towards the knee, and upwards towards the brisket. They occasionally appear on the hind-quarters, along the pasterns and large veins on the inside of the thigh, advancing to the groin and sheath; sometimes on the flank and lower belly. The most favourable appearance of farcy is when it appears on those parts of the jaws in which the blood-vessels are smallest, or on the *outside* of the shoulder or hips; but if it attacks the nostrils and the soft and sensitive parts of the neck, and the neck or plate-veins, and those inside the thigh, and these become corded, the case is difficult. The appearance of the buds, in the first instance, on the lower parts of the legs, where their extension and ulcerations may be apprehended, is an extremely unfavourable case. When farcy, which generally affects one side at a time, changes suddenly to the opposite one, a malignant degree of the disease is indicated, and if it arises on the spine, or on many parts of the body at once, the worst termination may be expected. The most cheering symptom is when it does not spread beyond the place where it first appears, and this shows that it is as yet only superficial and circumscribed, and not affecting the system generally. In this incipient state, as inflammation affecting the blood-vessels is the cause of the disorder, very moderate bleeding† and purging, with the application of the budding-iron to the tumours, (if any of them have broken, or appear about to break,) with a subsequent washing with a lotion composed of a drachm of corrosive sublimate dissolved in an ounce of rectified spirit, will probably effect a cure, provided that alterative medicines be given if the tumours have in any degree become ulcerated, for in this case the general constitution has become tainted. The alterative physic recommended is "corrosive sublimate in doses of ten drachms."

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* "The Horse."

As to regimen, oats in moderate quantities should be given, and green food, and especially carrots, with as much external air as the weather will permit, and moderate exercise at intervals, if the horse cannot be put out in a field. With the above treatment, farcy, if of a mild character, will disappear in a week or ten days. Mercurials and other powerful applications are recommended by many writers on farriery, and these, in many cases, are probably efficacious; but it is better to dispose of bad cases of farcy at once, by putting the sufferer to death; the owner will thus save himself trouble and expense, and relieve the horse from protracted misery. The symptoms of incurable farcy are thus described:—

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* "The Horse.'

† Bleeding is the only part of these directions not recommended in "The Horse," but it is advised in the Encyclopædia Britannica, probably on the ground that farcy, being an inflammatory disease of the blood-vessels, must be relieved by diminishing the quantity, and lowering the action of the blood.

> "When a farcy, by improper applications, or by neglect, has spread and increased, or after long continuance resisted the medicines above recommended; if fresh buds are continually spouting forth, while the old ones remain foul and ill-conditioned; if they rise on the spines of the back and loins; if the horse grows hidebound, and runs at the nose; if abscesses are formed in the fleshy parts between the interstices of the large muscles; if his eyes look dead and listless; if he forsakes his food, and scours often, and his excrements appear thin and of a blackish colour; if the plate or thigh-vein continues large and corded after firing, and other proper applications; these symptoms denote the distemper to have penetrated internally, and that it will degenerate into an incurable consumption; it is most probable also that the whole mass of fluids are tainted, and become irremediable by art."*

The ailment called water-farcy has no connexion with real farcy; it is merely an affection of the skin arising from cold, or dropsy, appearing in soft swellings in different parts of the body, and occasioned by foul feeding in the stable, or from the too free use of soft new grass at pasture in foggy weather. This is cured by scarifications of the skin and gentle purgatives, such as are used in the mild form of genuine farcy.

Colic—which is often produced from drinking cold water when hot, or eating flatulent food too greedily, always occasions sudden and violent spasms of the intestines. Inflammation of the bowels is often confounded with it, and treated consequently in the same way, though the mode of treatment proper for colic may not only aggravate the other, but render it fatal.

The symptoms, in the first place, are very different; the poor brute will spring up suddenly after lying down, paw, and roll, and turn its eyes upwards. The malady is also often indicated by a stretching out of the limbs, as if the agonies of death were present, and by the alternations of heat and cold in the ears and feet, and clammy sweats over the whole body. Sometimes too the poor animal endeavours to pass water frequently, and rolls on his back from the stoppage, which is aggravated by the pressure of the dung on the neck of the bladder. Three ounces of spirit or oil of turpentine, in a pint of warm† water, will generally give immediate relief; rubbing the belly also with a warm cloth, or brush, will stimulate the intestines, and alleviate the pain. If the spasms do not cease within half-an-hour, half of the above dose, with the addition of some aloes is recommended,* and gentle trotting, when the horse can bear motion, to accelerate the action of the medicine, and to relax the spasm, with injections of warm water. When the horse lies quiet for an hour or so without starting, or throwing out his limbs, the probability is that the danger is over. Pepper and such stimulants are objectionable, lest inflammation should be in any degree existing. It is so necessary to distinguish accurately between colic and inflammation of the bowels, that we shall here insert the distinctions and succeeding observations from the treatise which we take as our best authority.

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* Encyc. Brit.

† "The Horse."

Inflammation of the bowels is often quickly fatal in its results. This proceeds most frequently from exposure to cold, from a state of warmth. If a horse accustomed to a close stable and general good keeping, is suddenly chilled by standing in the open air, or in a draught of chilling atmosphere, or has his natural perspiration checked by any cause, he may be seized with inflammation of the bowels, which may be easily distinguished from mere *colic* by the less rapid approach of the disorder, and by previous intimations of fever, such as a very accelerated but small and faintly felt pulse, with a coldness in the ears and legs, while the belly is tender to the touch, and the *increasing* pain is *continued* without intermission. In the case of *colic*, the pulse is not much accelerated at first, though fuller, and there are intervals of ease, and the ears and limbs are not colder than usual; besides, in the latter ailment, the horse is relieved by rubbing his belly, and by moderate motion, and there is no diminution of strength, which is very obvious when he labours under inflammation of the bowels.

Bleeding *copiously* and without loss of time, is the first thing to be resorted to; eight quarts of blood may be safely taken in the first instance, and about half this quantity if the pain be not abated, and the pulse improved. Unskilful practitioners are sometimes afraid of a repetition of the bleeding, from the weakness of the subject, but they need not be so, it is the *inflammation* which induces the debility, and that must be subdued else the attack becomes rapidly fatal.

Strong purgatives are strictly *forbidden* to a horse in this disease, on account of the irritable state of the intestines. Clysters of thin gruel, with half a pound of Epsom salts, is the best laxative, and this may be repeatedly given; at the same time he should be encouraged to take warm mashes of gruel, with two drachms of dissolved aloes, every five or six hours. If the attack does not give way, from the above treatment, it will be necessary to blister the region of the bowels; and, though the stable should not be hot, it ought to be moderately warm; and, for some days after the inflammation has subsided, injections of gruel are recommended, and if there be green food, it will be better for the convalescent (with a little oats, after the inflammation has decidedly ceased) than dry hay.

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* "The Horse."

When inflammation accompanies purging occasioned by too sudden a change to relaxing and emollient food, injections of gruel or mashes to assist in getting rid of the irritating matter in the bowels will be sufficient without physic. The efforts of nature will remove the indisposition.

Worms. — Many horses periodically suffer severely from these, which indicate foulness of condition, and result, as in the human body, from weak digestion and debilitated stomach; calomel, so efficacious in the human constitution, is stated by the authors of the treatise so often referred to in this article, to be inert as an expeller of worms from the stomach or intestines of a horse, and only useful in quickening the operation of aloes.

The long round white worm is easily brought away by aloetic purges. When the labour of horses, however, is so valuable as to render it inconvenient to afford the time necessary for regular physicing, "two drachms of emetic tartar, with a scruple of ginger, made into a ball, by means of linseed meal and treacle, and administered half an hour every morning before the horse is fed," is recommended. The ascarides, or needle worms, which lodge in the larger intestines, and pass into the rectum, are very irritating; their presence is known by the white matter, which hardens and becomes powdery about the anus; and, if abundant, indicates that the worms occupy the rectum, (or strait gut.) An injection of linseed oil, or of an ounce of aloes, dissolved in warm water, will afford immediate relief, by dislodging them from their nest.

Botts, which attack many horses in the early part of summer, and continue their molestations for two or three weeks, are a large maggot with prickly feet, by which they adhere closely to the strait gut, on which they feed. Savin chopped and given with the oats, is said to destroy these worms in particular, and it is most desirable to get rid of them; for, besides the annoyance which they must give to the animal affected with them, they often occasion convulsions if they take up their abode in the stomach. We have not seen any suggestions for administering solutions of iron, which we believe to be efficacious; for, if a worm be put into a vessel of spa-water—such as that of Ballyspellane, in the county of Kilkenny, impregnated with iron, it will quickly die. Spirits of turpentine are very powerful in killing all worms, which are afterwards easily brought away by doses of linseed oil, or the oil and turpentine may be mixed. After worms have been destroyed by medicines, every food that tends to their reproduction should be avoided, and such things as tend to strengthen the stomach and promote digestion—salt, for instance—should be regularly given. While infested by worms, the horse is generally indisposed; food does him no good, and his hair stares as if he was labouring under

Surfeit.—This arises either from obstruction in the pores of the skin, when the horse is casting his hair, or from over-feeding suddenly upon unwholesome food, and frequently from drinking cold water to excess, when in profuse perspiration, and consequently when the blood is in a state of rapid circulation, the sudden checking of which, by natural causes unnecessary to detail, induoe the roughness and derangement of skin which denote the presence of the disease. Bleeding is good, and the following alterative:—"antimony, nitre, and sulphur, in doses of two drachms of the first, three of the second, and four of the last, and repeated every night in a mash; the peculiar effect of the antimony and sulphur on the skin, of the sulphur on the bowels, and of the nitre on the urinary organs, will be here advantageously combined."* If surfeit be neglected, or become very obstinate, it may degenerate into

Mange—which first appears at the root of the mane, spreading gradually, if not immediately checked by two or three doses of mercurial physic, and the application of ointment (composed of an ounce of flower of sulphur, with an equal quantity of train oil, and half an ounce of common turpentine) to the infected parts, from which the hair quickly falls off. The ointment should be well rubbed in, after the scruff has been washed off with soap and water, and the skin well dried. Mange, unless from contagion, does not attack well-fed and well-groomed horses. It has its origin in hard usage and insufficient food, and is, therefore, usually confined to the horses of the poor.

To prevent infection, every thing about the mangy horse, after his cure or removal, should be carefully scrubbed or scraped, and the stable walls, &c. washed with chloride of lime and water; "the currycomb may be scoured, but the brush should be burnt." Precautions cannot in such cases be too carefully observed, though it may appear improbable that a few particles of dust or dandriff from a currycomb should communicate disease.†

An itching, however, may arise from inflammation of the skin, in consequence of over repletion. This may be soon allayed by bleeding, or a dose of physic. If the skin have a scurfy appearance, suspicion should be aroused. Black antimony, nitre, and sulphur, are excellent medicines for the mange.

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* "The Horse."

† This is at least as probable as the statement recorded by some enthusiastic *contagionist*, of a case of plague communicated to a man who chanced to pass under an open and very elevated window, at the moment when a convalescent patient, in the act of scratching his head, caused a particle of dandriff to fall on the crown of the passenger's hat!

Lice in the skin are easily destroyed by washing with a decoction of tobacco—an ounce to a pint of water—or by an application of mercurial ointment, if the vermin are confined to one spot. Tobacco-water is sometimes used in cases of mange also; but unless the irritation is partial, it is dangerous to apply this powerful decoction. Washing an extensive surface with it, may repel the cutaneous humours into the system. After this, or mercurial ointment, cold must be guarded against by clothing and warmth of stable. Poor feeding and neglect often render the skin

Hidebound.—In this state the hide loses its flexibility, and acquires a degree of stiffness, as if it adhered to the bone; there is at the same time a scurf in the skin which makes the hair stare and turn different ways, and the horse sweats upon the slightest exertion, and becomes languid and heavy; his dung is dark-coloured and offensive, and proves that there is a derangement of the digestive organs. Moderate blood-letting, and bran mashes every night for a fortnight, with two ounces of flower of sulphur every second night, and a little old beans occasionally in the morning feeds, to prevent too much relaxation of the bowels, are efficacious, with regular exercise, sound hay and oats, and good soft water. Should tension of the skin continue with the above treatment, there will be reason to suspect that some other ailment is lurking in the constitution, which will render it prudent to give a course of mild physic, with good feeding between the doses.

IMPLEMENTS OF HUSBANDRY.—There are certain articles under this head indispensable for every farm, however small its scale. The plough, harrow, roller, cart, wheelbarrow, spade, shovel, pick, hoe, rake, scythe, are essential to the culture of even half-a-dozen acres, and the number and varieties of these common implements must be determined by the mode of husbandry pursued, and the skill and capital of the farmer.

In Flanders the use of complicated implements is unknown; our modern inventions have not been adopted there; they have no drill-machines, nor scarifiers, nor horse-hoes, nor even threshing-machines, and yet the agriculture of that country is perfect. The farms, as already stated, are generally small, and similarly circumstanced with those of the Irish small holders; and manual labour—steady and unremitting—is substituted for machinery. The implements which the Belgian farmers, of the greatest extent, use, are easily enumerated—

The old heavy Walloon plough, similar to the Kentish turn-wrest plough, with wheels; and the swing-plough, which acts on the principles of a shovel, the share being very broad, and the sole a kind of sledge, formed by the end of the share towards the heel, and the lower end of the turn-furrow.* In light land one horse is sufficient for this plough, and he will turn an acre in the day.

Light harrows with wooden tines are also common in Flanders, set at an angle in the forepart of a triangular frame, drawn either by the angle towards which the tines incline, or from another angle, according as the purpose be to drag weeds to the surface, or to cover the seed, or smooth the surface; carts and waggons, ponderous and clumsy; rollers of stone and wood; hand-hoes and rakes; the Hainault scythe, described in page 212, which is an improved fagging-hook; the mouldebaert, or mollebart, (see *Mouldebaert;*) the *traineau,* (see *Sledge;*) the winnowing machine; and in some districts, a peculiar flail, which detaches the chaff from the corn more effectually than the common flail; the spade; and the shovel.

We are by no means advocates for the use of complicated or expensive machinery, except on very extensive farms, and occupied by persons to whom speculation in this way cannot be injurious; but to the encouragement of ingenuity in the invention or improvement of useful implements, every encouragement should be afforded by public societies and wealthy land proprietors. An outlay for the purchase of costly instruments may, in saving of time and labour, be frequently economical in a great degree. We would only suggest caution and prudence, and a determination in general not to infringe seriously on capital by the purchase of *unnecessary* implements, nor of any until their use and excellence are fully ascertained by *practical* men of judgment and experience. Vast sums have been expended by theoretical *amateurs* in the hasty purchase of cumbersome and complex machinery—for drilling corn, for example—which has afterwards been abandoned on trial, because the soil proved unfit for drill culture, or from some other equally forbidding circumstance.

There is no collection of agricultural implements in the United Kingdom, so extensive and complete as that of the Messrs. Drummond at Stirling; and we cannot better convey to the farmer a satisfactory notion of what he may require, with the probable cost, than by laying before him the list of implements, &c. published by those eminent manufacturers.

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* See Outlines of Flemish Husbandry, the most interesting and useful of all published tracts.

“ 1.—For Operations on the Soil.

		£	s.	d.
“Ploughs, Iron Swing, Ferguson's, Wilkie's, Grey's, and from other approved makers	from 80s. to	5	0	0
Ploughs, Subsoil, of sizes from 200 to 400lbs.	100s. to	8	10	0

This Implement, invented by Mr. Smith of Deanstone, for the purpose of breaking up, without bringing to the surface, the subsoil, is now extensively used, and attended with the most beneficial effects. An assortment of the different sizes, prepared under the auspices of the inventor, is at all times on sale at the Repository.

		£	s.	d.
Plough, Deep Furrow or Trench, wooden, on the model of the one used by Mr. Smith, for turning up and mixing the soil to the full depth, which had, in the preceding rotation, been penetrated by the subsoil plough,	80s. to	5	0	0
Do. Iron, of sorts,	140s. to	8	10	0
Harrows, Rhomboidal and others, of the most approved construction,	40s. to	2	10	0
Rollers, cast Iron, of sorts,	160s. to	12	0	0
Finlayson's Improved Harrow or Grubber, of sizes	130s. to	8	0	0
Kirkwood's Grubber, of sizes	200s. to	12	0	0

These Grubbers are very effective in the working of fallows, and in extirpating root-weeds, and in many places may be substituted for the plough, with a great saving of labour.

		£	s.	d.
Drill Hoes, of the most approved construction	30s. to	2	0	0
Diamond Drill Harrow, very effective		2	10	0
Double Mould-board Plough		5	0	0
Double Mould-board Plough, furnished with coulters for paring and hoeing	120s. to	7	0	0
Spades, of sorts for ditching, &c.		0	4	0
Lime shovels, of sorts		0	4	0
Hand Hoes, of sorts, with handles	1s. 6d. to	0	2	0
Dung Forks, with do.	3s. to	0	4	0
Pick Axes and Mattocks, with do.	5s. to	0	6	0
Spade and Fork Handles	1s. to	0	1	6

“ 2.—For Draining.

		£	s.	d.
“ First, or Surface Spade for Drains		0	4	0
Second, or Narrow do. for do.		0	4	9
Third, or Narrowest do. used only for Wedge Draining		0	4	0
Scoops, for cleaning out the bottoms of Drains	4s. to	0	5	0
Pick, used where stones abound		0	5	6
Set for the small stone drain, (1st and 2d Spades, and a Scoop)		0	14	0
Do. for do. where a Pick is required, (1st and 2d Spades and a Scoop, with a Pick and large Scoop for throwing out the loosened earth,)		1	4	0
Do. for the Tile Drain, (1st and 2d Spades, and a Flat Scoop,)		0	14	0
Do. for the Wedge Drain, (1st, 2d, and 3d Spades, and a Narrow Scoop,)		0	16	0

		£	s.	d.
Harp Shovel, for separating the earth and rubbish from the small stones in filling the Drain		0	6	0
Harp Machine, mounted on 3 wheels, used for the same purpose as the Harp Shovel	100s. to	6	0	0
Spade, for cutting Drain Tiles of Peat		0	8	0
Drainer's Clogs	4s. to	0	6	0

“ 3.—For Sowing.

		£	s.	d.
“ Broad-Cast Sowing Machine, for grain and grass seeds, drawn by one horse, sows about 24 acres per day		12	0	0
Drill Sowing Machines, for 2 drills		5	0	0
Do. do. do. for 3 drills		6	0	0
Do. do. do. for 5 drills		10	10	0
Do. do. do. for beans, 2 drills		5	0	0
Do. do. do. do. 1 drill		1	10	0
Turnip Drill-Sowing Machines, for 2 drills	150s. to	9	0	0
Do. do. do. do. for 1 drill	40s. to	2	10	0
Turnip hand-Sower		0	2	6
Sowing Baskets of sorts, for one or more hands		0	4	6
Corn Skeps or Straw Baskets, for carrying corn		0	2	6

“ 4.—For Reaping and Gathering the Crop.

		£	s.	d.
“ Smith's Reaping Machine—acts with revolving cutters; propelled by 2 horses; cuts down from 8 to 10 imperial acres per day. From the simplicity of construction of this machine, and the excellence of its work, under ordinary favourable circumstances, it is likely to come into general use so soon as better cultivation shall banish the convex ridges and rough uneven surface, which still so frequently occur		50	0	0
Bell's Reaping Machine—cast-iron frame; acts on the clipping principle; cuts from 8 to 10 imperial acres per day; propelled by 2 horses. Has been a good deal employed in the Fife and Dundee districts, where it is much approved, and found very profitable		45	0	0
Drummond's Reaping Scythe, iron-handled. One man with this Scythe will cut down from 1½ to 2 imperial acres per day. The corn may be cut *out* from the standing crop when not very much lodged, otherwise cutting *in* is better, though some prefer cutting in at all times. When the rake is taken off, it is equally adapted for hay cutting. From the very satisfactory accounts which have been received, and which may be seen at the Museum, from various districts, where this Reaping Scythe was extensively used last season, it may with full confidence be recommended to the attention of Agriculturists		0	13	0
Scythe Hooks of sorts	1s. to	0	1	9
Teethed Sickles of sorts	6d. to	0	0	8
Harvest Gloves (per pair)	8d. to	0	1	0
Scythe Blades, patent, and labelled	3s. 6d. to	0	4	6
Scythe Handles or sneds, wooden	1s. 6d. to	0	2	6

		£	s.	d.
Scythe Handles, or Sneds, iron	3s. 6d. to	0	5	0
Scythe Stones and Streaks	3d. to	0	0	6
Sheep Shears		0	3	0
American Hay or Stubble Rake, with long straight wooden teeth, drawn by one horse, very effective	40s. to	2	10	0
Stubble Rake, with curved iron teeth, drawn by 1 horse, is much approved in East Lothian and Berwickshire	70s. to	4	0	0
Do. do. with curved iron teeth, drawn by the hand	15s. to	1	5	0
Hand Hay Rakes	1s. to	0	1	6
Hay Forks	2s. to	0	3	6
Potato Forks	1s. 8d. to	0	2	0
Split Baskets, for carrying potatoes, very durable		0	1	6

“ 5.—IMPLEMENTS OF THE BARN.

		£	s.	d.
“ Threshing Machines for 2 to 6 horses. The machinery of these are not kept on hand, but are furnished to order, from the best makers	£40 to	80	0	0
Flails		0	2	6
Winnowing Machines or Fanners, with a set of Riddles and Sieves	160s. to	9	9	0
Do. do. of various sorts and sizes	80s. to	7	0	0
Riddles and Sieves, wooden	2s. 6d. to	0	3	0
Do. do. of iron wire	3s. to	0	4	0
Barley Hummeller, for attaching to a thrashing machine		5	0	0
Do. do. for the hand		0	6	0
Imperial Measures for grain, full set		0	18	0
Do. Bushel Measure		0	12	0
Corn Sacks or Bags for 4 or 6 bushels	1s. 9d. to	0	2	6
Cloth for do. per yard	7½d. to	0	0	9
Hemp Ropes, per lb.	5d. to	0	0	8
Truck or Barrow for carrying sacks of grain		1	0	0
Weighing Machine for do. weighs from 1 to 10 cwt.		8	8	0
Muirhead's do. 1lb. to 5 cwt.		2	10	0
Gart Steelyard, for do.	70s. to	5	10	0
Gart Steelyard for cart loads, &c.	280s. to	16	16	0

These Steelyards, invented by Mr. Davidson, Edinburgh, are considered of great value from their minute accuracy and portability, as they can be easily moved about wherever wanted.

		£	s.	d.
Weighing Implements, of various construction, for weighing from 1lb. to 200lbs.	10s. to	11	0	0
Machines for twisting straw ropes—twisting 3 at a time, and saving the labour of two people	20s. to	1	5	0
Straw Rope Twister, of iron		0	2	0
Stack Pillars, of cast metal	3s. to	0	4	0
Wooden Shovels, for granaries	2s. to	0	5	0
Sparred Potato Shovels for turning or filling up potatoes, allowing any earth or rubbish to escape		0	4	6

“6.—For Preparing the Food of Horses and Cattle.

		£	s.	d.
“Straw and Hay Cutting Machines, of sorts - Wrought by a man and boy; cuts into lengths of about half an inch, from 1 to 1½cwt. in an hour; the cut straw or hay is given mixed with oats, and is considered to effect a saving of about 30 per cent. of the consumption incurred by the old system.	120s. to	8	10	0
Straw Cutting Knife, for working in a trough - -	30s. to	2	0	0
Corn Bruisers. Wrought by one man, bruises 4 bushels in an hour, effects a saving of about 25 per cent. - -	160s. to	9	0	0
Turnip and Potato Slicers, of sorts - -	60s. to	7	0	0
Turnip Cutting Spade, quarters the root with one stroke - -		0	10	0
Hay Knives, of sorts - - - -	2s. 6d. to	0	3	0
Potato Washing Machines - - -	60s. to	4	0	0
Potato Washing Basket - - - - -		0	4	0
Steaming Apparatus, for steaming the food of horses	200s. to	12	0	0

“7.—Utensils of the Dairy.

		£	s.	d.
“Milk Pails - - - - -	1s. 6d. to	0	2	0
Milk Sieves of hair or wire - - -	10d. to	0	1	6
Do. do. of perforated zinc - - - -	3s. to	0	4	6
Milk Coolers of Wood and Tin - - -	2s. 6d. to	0	4	0
Do. do. of zinc - - - - - - -	3s. to	0	4	6
Zinc Apparatus for increasing the butter in churning 11 per cent.	15s. to	1	5	0
Plunge Churns, of sizes - - - - -	10s. to	0	18	0
Oval Churn, sizes from 5 to 30 gallons, is now much approved of as by far the best for a dairy of one to 10 cows, and is remarkably easy wrought - - - - - - -	22s. to	2	5	0
American Churn for a dairy of 10 to 20 cows. Turned by a dog walking leisurely on an inclined plane, is found very efficient and economical - - - - -	120s. to	7	0	0
Cheese Knives as used in Ayreshire - - -	8s. to	0	12	0
Curd Breaking Machine, for breaking the curd of skim-milk cheeses		1	5	0
Chessarts, or Cheese Moulds - - -	2s. 6d. to	0	4	0
Cheese Press, wrought by a screw - - - -		0	18	0
Ayrshire Cheese Press, much approved of for giving a continued equable pressure - - - - -	40s. to	2	10	0
Thermometers - - - - - -	4s. to	0	5	0

“8.—Miscellaneous.

		£	s.	d.
“Cattle Stomach-Pump - - - - - -		3	3	0
Steel Probes, used for cattle hoven at the stall - - -		0	3	0
Injecting Instrument for cattle - - - - -		0	5	0
Probang or Turnip Rammer, the most improved - - -		0	7	0
Spring Phleme, of safe and easy operation - -	10s. to	0	12	0
Rings for leading bulls, &c. - - - - -	4s. to	0	6	0

		£	s.	d.
Wire Gauze Lanterns, very safe in the stables or barn, and economical	5s. to	0	7	0
Measuring Chains		0	11	0
Do. Tapes	4s. 6d.	0	6	0
Do. do. new self-acting	6s. to	0	10	0
Dynamometer for measuring the force exerted in drawing the plough, &c.		2	2	0
Corn Balance, for giving the weight per bushel from a grain sample		2	2	0
Paling Nails (per 1000)		0	5	0
Paling Mallets, of sorts	8s. to	0	10	0
Greig's Vermin Traps, of sizes	3s. 6d. to	0	4	6
Mole Traps, of sorts	1s. to	0	2	0
Sawing Machine, for cross-cutting logs of fire-wood, &c., easy to work, and saves the labour of one man,	30s. to	1	15	0
Road Scraping Machine, very useful on public roads		3	15	0
Bar and Chain for binding Cattle at the stall		0	4	6

IRRIGATION—in its agricultural sense, implies the watering of grass-lands with running water at certain intervals, by means of artificial construction. Irrigation has been practised from the earliest ages on a gigantic scale, and with great skill by the Egyptians, who render the turbid waters of the Nile, in its periodical overflowings, the means of fertilizing their arid soil; but in no country is there more scientific knowledge of this branch of husbandry than in England; although the extent of actual practice there is very limited. Neither Ireland nor Scotland has yet appreciated the importance of water, mechanically conducted over the surface; though the mountain rills and frequent rivers in those portions of our empire afford extraordinary facilities for irrigation. The general indifference which prevails regarding the application of such an available source of productiveness is lamentable. Where defective husbandry prevails, irrigation is peculiarly desirable; and, in proportion to the advancement of agriculture, will the necessity for it diminish. Where a system of perfect culture prevails, the adventitious aid which a current of water affords may become unnecessary, or even injurious; but in some localities, the practice of watering grass-land will be always beneficial.

Mr. Lock, M. P. for the county of Sutherland, and agent to the noble proprietor of almost the entire estate of that county, mentions, in his work on the improvements of the estates of the Duke of Sutherland, that "there is a sort of national prejudice against the practice in Scotland," and, though Mr. Stephens, a professional drainer and irrigator of celebrity, has irrigated a good deal in Scotland, for some proprietors, the exceptions to Mr. Lock's observations, as regards individuals, are so rare as to confirm the correctness of his expression, in its general sense.

Local circumstances, it is true, are often highly unfavourable to irrigation, but wherever facilities exist, and the details of practice are properly executed, numerous examples and unanimous opinion of its efficacy sufficiently attest the advantages of irrigation, and the benefit which land-owners would derive from the extension of it. In order to render them successful, there are just three requisites necessary—inclination, pecuniary ability, and skill. The first condition seems easy enough, for every man is naturally desirous to increase the value of his property; but if in order to do so, he must encounter extraordinary and unaccustomed labour, or make pecuniary advances, on what is to him a mere experiment of doubtful result, then he dreads the untried and innovating operation, and rests content with his previous jog-trot and imperfect system. This force of habit is one of the principal obstacles to general advancement of local agriculture, and without actual example before them, neither proprietors nor tenants, except in a few instances, will abandon their previous system.

The second qualification applies both to the pecuniary means of the agriculturist and to local obstacles. Unquestionably nothing can be effectually done without spare capital; but in irrigating, the expense is ordinarily very trifling, far less than what is required as outlay in many other branches of husbandry, and not beyond the resources of any farmer in solvent circumstances. Besides, in many difficult cases, the work may be executed by the combination of funds, by the association of individuals interested in the results. Even under the most disadvantageous circumstances of locality, skill, industry, and capital combined, might, wherever the means can be obtained without excessive preparatory expenditure, produce surprising advantages.

The last requisite—skill—the scientific and practical knowledge of the subject, is here of extreme importance; for without it the land proprietors, (who ought to be themselves the *feeders* or channels for the diffusion of the pecuniary supplies,) will not be able to see clearly their individual interest in promoting this branch of agriculture; and this scientific skill is yet rare among our practical men, because there is little or no demand for their services; and though there may be some elementary and general knowledge, even among some of the land proprietary, and unquestionably there are some excellent treatises on irrigation, (that of Mr. Stephens for example,) the number of practical men is, for the satisfactory reason just already assigned, very inconsiderable.

It is, perhaps, necessary to give an explanation of the principal terms used in irrigation.

Weir.—This is made of timber, stones, or brick, with a number of openings, (*hatches*,) varying according to the breadth of the river, to let the water through. Its use is, to stop the stream (when the hatches are closed) in order that it may rise high enough to overflow the banks, or by arresting the flow of water in its natural course, to turn it by mains in some other direction.

The Sluice differs from the weir in having but one opening.

Trunk.—This is placed where cattle or teams are to pass over, or to conduct a smaller stream at right angles under a larger one, or to water lands lower down the stream. It is made of timber, and varies in length and diameter according to the purposes for which it is required.

A Drain Sluice is placed in the lowest part of some main in order to drain it. This is made of squared boards of dimensions proportioned to local circumstances; its use is, to carry off the water that oozes into the drain when the water is turned into some other direction, and prevent it from lodging on the land and rotting the herbage.

Hatches.—Little wooden doors to fit closely in the weirs; they are kept closed or raised higher or lower according as the water is to be restrained or let loose.

Headmain.—A ditch drawn from the river to convey the water from its ordinary course, and into lesser mains or trenches which are taken from this at right angles, or nearly so.

Trench.—This is merely a narrow shallow ditch tapering towards the lower end, to convey the water from the mains, and prevent it from flooding the land.

Trench-drain.—This is cut parallel to the trench to receive and carry off the water which has overflowed the land above it, but not deeper than the tail water drain will permit.

The tail water drain is the receptacle for all the water that runs from the other drains, which does not directly discharge itself, and it should run at right angles with the trenches.

There are also *gutters*, or little grooves for the conveyance of the water to those parts of the field which, from irregularity of form, would not be flooded.

Carriage—A hollow conductor made of timber, brick, tiles, &c., to convey the water from one main to another at right angles to it, of the same depth and breadth with the main to which it belongs, and of length corresponding with the breadth of the main it crosses.*

"The advantages of irrigation judiciously managed are great, almost beyond the conception of those who have not had an opportunity of witnessing its effects. The worst land, coarse gravel without any mixture of earth, alone excepted, is capable, by irrigation, of being rendered many times more valuable; and this very often at little or no expense. We lately saw this fact illustrated in a farm a few miles south of Dublin, where the steward conducted a stream over three acres of meadow land, in channels or feeders, which he opened with the plough in less than a day. The increase of hay, and the luxuriance of the after-grass, were greater than they would have been after a top-dressing at an expense of five pounds per acre. A bare enumeration of the extensive tracts of land which have come under our notice in various parts of Ireland, and which are susceptible by this simple improvement of having their value increased from one to one hundred-fold, would occupy more space than we can at present devote to it."*

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* See Boswell's Treatise on Irrigation.

Irrigation should be practised only from the end of autumn to the commencement of the spring. The *general* description may be thus given:—

"A stream is diverted from its course when descending from higher ground, and carried in a level course along the brow of the hill intended to be watered; similar carriers or levels are formed parallel to the upper one at intervals down the declivity, and the water being admitted flows over the brim of the highest level, and passing through the grass in a stream half an inch or more in depth, is received into the next level which it overflows, and is caught in a third, and so on. It is finally carried off by a stream in the lowest part of the ground. This is called *catch-work* irrigation, and is not only easily formed, but as the water can be completely drawn off whenever it is wished, by causing it to descend by its proper channel, the grass is less liable to become coarse, than in meadows on comparatively level land. In the latter case, namely, in districts comparatively level, a weir or dam is formed across the stream or river, and the water being by this means raised, the whole or a portion of it is carried in a main leader along the highest part of the ground to be watered; from this leader it is distributed over the surface in secondary leaders or feeders, and open drains being formed in the lowest part of the ground, receive it and carry it off to some rivulet. In some places the ground is prepared at a great expense, in order that it may receive the water with the greatest advantage; with this view the surface sod, if it be pasture, is pared off with the breast plough, and the sods being laid aside, the ground is thrown into ridges of about forty feet broad, and about eighteen inches higher in the centre than at the sides; a drain or channel is formed on the crown of the ridge, after which the sods are laid on and made firm by rolling; the water is then admitted by a main leader which is carried along the highest part of the field, from which it passes into the channels on the summits of the ridges, and sods being placed in these channels at intervals of a perch or thereabouts, the water is made to flow over the ridge, and being received in a drain in the furrow is carried off. The channels on the crowns of the ridges become narrower as they recede from the main leader; and this also gives a tendency to overflow.

"Should the land be naturally moist, it is absolutely necessary that it be effectually drained previously to having water brought upon it, as the success of the art depends entirely on the power of rendering the land quite dry at certain times, particularly in summer, thereby extirpating aquatic or marsh plants, and encouraging the finer grasses."†

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* Review of Mr. Stephens' work on Irrigation, by E. M.—*Irish Farmer's Magazine.*

† Ibidem.

The mode of *managing* water-meadows is thus detailed in the Bath and West of England Society's papers, by the Rev. J. T. Hamilton:

"October and November.—About the middle of October, the after-grass having been eaten off, all the ditches, troughs, and drains must be thoroughly cleansed by the spade and breast plough, from weeds, grass, and mud, and well repaired, if they have sustained any injury from cattle. The cleansings should be used, and trodden down even, in any parts of the meadow that are lower than the rest, to make every ridge a perfectly inclined plane, and ready to receive the first flood that may now offer itself.

"The effects of early watering are very important in strengthening the roots and stalks of the plants, and preparing them for shooting up strong and vigorous in the ensuing spring; and the blades that now rise, form a rough coat against winter, protecting the vital organs of the plants from the winter cold. Besides, if the meadow must be watered in separate divisions, and at different periods, it must happen that by delaying the operation till November, some parts of the meadow may receive no water sooner than December or January; and should these months be severe, it may become wholly impracticable to complete the operation at that season. The duration of this autumn watering ought to be about three weeks, with a dry interval of a day or two, and then the works are made as dry as possible to encourage the growth of the grass. Should the water now arrive in the shape or magnitude of a flood, as much of it as possible, without injuring the banks of the works, ought to be turned over the meadow, as the water at this season, being the first washing of the arable lands on the sides of the chalk hills, as well as the dirt from the roads, and runnings of towns and villages, is peculiarly enriching.

"December and January.—The chief care of the irrigator now consists in keeping the land sheltered by the water from the severity of frosty nights. It is necessary, however, every ten days or fortnight throughout the winter, to give the land air, by taking off the water entirely, otherwise it would rot and destroy the roots of the grass. But in severe frosts it is not very safe to remove the water, as it operates so far to protect the grass; and if exposed wet to frost, it might be greatly injured. If it be necessary to alter the water in such weather it ought to be done in the morning of a dry day; and should the frost continue severe, it might be again covered during the night. When the frost has given a complete sheet of ice to a meadow, it is advisable to discontinue floating.

"February and March.—In February every division of the meadow requires to be again watered; but at this season a more than ordinary degree of attention is necessary. If the water be allowed to remain on the meadow for many days without intermission, a white scum is generated, which is destructive to the grass, and warns the floater instantly to remove the water. Some meadows that will bear the water three weeks in October, November, or December, will perhaps not bear it a week in February or March, and sometimes scarcely two days in April or May. In the month of February two waterings, of five or seven days each, should be given; and in March three, of three to five days each, according to the state of the air, ever suffering the water to remain on longer in cool than in warm weather. In a late season or climate, it may be necessary to continue the watering to the end of March, and sometimes, in the backward situations, to the middle of April. But in low warm districts, and in favourable seasons, the operation is finished in the end of February.

"By the middle of March, the grass on the old floated meadows will generally be sufficient to afford abundant pasturage to all kinds of stock, and the water is then taken off for a week, that the land may become firm and dry for the admission of cattle. Rolling at this season is also deemed advantageous. The early spring feeding ought never to admit heavier cattle than sheep, calves, or young cattle; for large cattle do much injury by poaching the ground, destroying the trenches, and spoiling the grass. During the first week of spring feeding, if the season be cold or rainy, it is proper to give the cattle a little dry hay in the evening, to intermix with their moist food.

"April.—In the course of this month the grass of the water-meadows must be completely eaten off; for should the pasturing be extended to a single week in May, it is said that the hay crop will be ruined in quality, as it will prove soft, woolly, and unsubstantial, like an aftermath crop.

"May.—The meadow having been eaten bare the preceding month, the water is now admitted for a few days, which will in general ensure a good hay crop, in the course of six or seven weeks. It is of great consequence to have the hay in ricks before the Lammas rains commence, which may be easily effected, if the stock is removed from the pasture by the first of May.

"In making the hay of watered meadows, the whole must be spread out equally to dry, then turned light'y with rakes, and in the evening put into very small cocks. Next day it is again spread out, turned a second time with rakes, and in the evening put into larger cocks. In this form it may remain for some days, then it is once more spread out, turned, and carted away to the driest spots to be put in summer ricks, containing from 20 to 30 stones each rick, of 24lbs. avoirdupois the stone, and there remain till it is taken to the winter stack. In other situations the hay is carted immediately from the cock to the stack. The form of the latter is various. Mr. Boswell recommends round stacks: but these are not without inconveniences. A round form does not admit of cutting away portions, without loosening the bindings; and when the size is large, the hay is more apt to heat. The stack should be of a rectangular form, ten or twelve feet wide, and of any length, placed due north and south. The owner begins to cut any portions he thinks proper at the north end of the stack; and if only ten feet wide, thirty feet long, and nine feet high, when built, exclusive of the head, it will contain about 500 stones of 24lbs. The stacks ought to stand parallel to each other, at least ten feet asunder to allow laden carts to back between them, and admit a free circulation of air in every direction. The bottoms should be laid with stones.

"To prepare for aftermath pasture, or green-house feeding, the water may be again thrown over the meadow for a few days, and then left quite dry till the grass rise, and be fit for introducing cattle. But if sheep are to be admitted, no water should be used on any account, as summer watering infallibly induces rot. It is notwithstanding remarked, that no watering is so enriching as that which is given during summer floods. In the practice of irrigation, meadows require a much greater proportion of days throughout the year to be dry than to be floated; and this proportion seems to vary according to circumstances in the soil, water, and climate; but all the periods of watering included seem to run between six and nine weeks throughout the year."

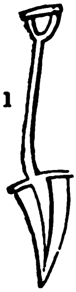
The following additional extract from Mr. Hamilton's essay will show what may be effected at little or no expense in thousands of places in Ireland:—

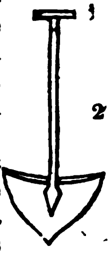
> "A small meadow of four acres, at Skelfhill in Roxburgshire, finished in 1800, and consisting of bog, formerly manured for hay, and of loam, formerly in pasture, is watered in catch-work, by means of a very small mountain rivulet. The whole expense of forming this meadow did not exceed *one guinea.* Mr. Scott, the tenant in 1804, fed on these four acres of meadow forty ewes and their lambs, from the 18th of April to the 10th of May; and he mowed a crop of hay in the last week of June following, amounting to forty summer ricks of twenty stones each, which was at the rate of 200 stone per acre, after spring feeding. The aftermath was considerable. It deserves notice also, that the most of the circumstances attending this meadow would to a stranger appear unpromising. It has only a small rill to feed it; the situation is high, the declivity steep, on the brow of a hill, and with an unfavourable aspect towards the north; yet notwithstanding all these obvious disadvantages, and the small expense of forming it, this little meadow continues to be extremely productive."

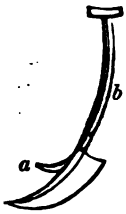
Subterraneous irrigation in dry weather, by which the soil is saturated with water by means of covered drains intersecting the surrounding mains, has been introduced by Smith and Johnston into some parts of Scotland. This is effected by closing the sluice which lets off the water at the lowest level; and thus throwing back the water into the cross drains, which gradually fill and soak through the whole area of the field. Our climate is too moist to render the adoption of this process general.

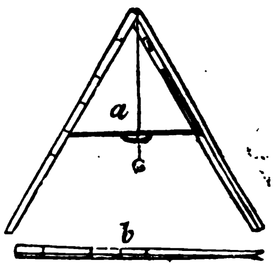
Warping.—This term is derived from the word *warp*, a designation we believe first given to the rich mud which is accumulated in the estuary of the Humber by the rivers which flow into that river, and is by means of embankments retained on the adjacent soil over which the tide flows, and from which the waters retire through sluices. This mode of fertilizing land has been practised for more than one hundred years in the parts of Yorkshire through which the tides of the Humber flow; and in many instances land, originally of the most worthless description, has been raised to enormous value by means of warping, though frequently at a considerable expense, which is, of course, more in proportion on a small than on a large tract. The sediment left by the successive tides (the season for warping commences in July) is so exceedingly rich, as to bear enormous crops of beans, potatoes, and clover, which is sown for at least two years before a corn sowing is attempted. It is a matter of indifference whether the land on which the warp is accumulated be of itself good or bad, as a totally new soil is created.

The Polders, in Flanders, are large tracts rescued by embankments from the dominion of the sea, and brought into high cultivation; and if associations of wealthy capitalists would incorporate themselves for the purpose of enclosing some of the many thousand acres of rich slime in the creeks and bays on the coast of Ireland, great results would accrue.*









The implements necessary for scientific irrigation, are—a spade with a bent handle, about three feet long, and a cross bar to press upon; the iron part should be about a foot wide in the middle, tapering to a point, with a thick ridge from the stem down the middle. The edges should be very thin, and kept constantly ground and whetted; (the cut (1), taken from Loudon's Encyclopædia, gives the form correctly.) A crescent spade (2,) to act like a gardener's edging-knife, for marking out the sides of the mains, &c. &c. This also should have a cross handle as—The turf-knife, a scimitar-like blade, with a tread for the foot, (*a*), and a bent handle, (*b*); it is also used for marking out. A rafter level (the least expensive) ten feet in the span, of two inch spars, but strongly joined together. The plummet (*a*) is suspended so as to act like a pendulum, and the lower bar is marked off in inches from the centre. By moving the instrument forward, either the rise or fall of the land will be pointed out by the undulation of the plummet, and thus, by marking the time of its descent with small sticks or pegs fixed in the ground, at short distances, the course through which the water should be conducted can be laid down with tolerable accuracy. It may be closed like a walking-stick, (*b*). Wheelbarrows; shovels of different shapes and sizes; hand-barrows; a scythe to mow weeds; forks or drags to draw out any roots which may vegetate in the large mains; and, to complete this list of unexpensive requisites, a pair of huge waterproof boots, long enough to draw up half the length of the thigh, and wide enough to admit a good supply of hay to keep the extremities warm, for it is no joke to stand, or waddle about in cold water, as is often necessary during many hours of the day.†

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* Since this publication commenced, one company has been formed for embanking a portion of Loch Foyle. We heartily wish success to the enterprize, although we have no shares in the undertaking.

† See Loudon's Encyclopædia of Agriculture.

Sound, dry, and warm land, receives almost instantaneous improvement from irrigation. Boggy land, even in its natural state, is also greatly improved by it, and produces, in consequence, heavy crops of coarse hay, serviceable for store-cattle; but clay soils are the least susceptible of benefit, on account of their cohesiveness, and being generally on a dead level. They also require a strong body of turbid water to render them fruitful; but if they be drained completely, and a warm spring succeeds the period of irrigation, the crops of grass will be very heavy. There are some general principles which every irrigator should understand.

Water, at any distance, will rise to the level of the source whence it springs. If, therefore, it be lowered at any places, suppose to allow another stream to cross it by a conductor, it will, when it has passed under that stream, rise again as if there had been no *carriage* over it. It will continue to run into any canal, or other receptacle (supposing the sides high enough) until it attains the level of the water at the place from which it is drawn.

All rivers and streams have some degree of descent; it follows, therefore, that if a main be taken high enough above the stream, that water can be brought over land by the river side, though the river opposite that very place should be considerably under the level of that land.

The greater the descent, the greater the benefit to the land, on account of the rapid motion of the overflowing water, which continues to run into every canal or other receptacle, supposing the sides high enough, until it reaches the elevation of the water at the place from which it flowed. It may be necessary to add, that it should be always ascertained that water can be completely carried off, after it has done its work, as stagnant water is highly injurious to land.*

ITALIAN RYE-GRASS.—This grass, recently introduced into the united empire, is either a native of Italy or Germany, and probably perennial. It differs from the common kinds of rye-grass in many botanical particulars, which it is needless to enumerate, and which are only intelligible to the scientific eye; but to the ordinary observer it differs very perceptibly from them, in presenting a darker green colour, and in having much more abundant and broader foliage. It very commonly attains the height of four feet, and sometimes more, and is not inclined to spread on the ground. If sown in September it may be cut in the following May, and if sown early in March it will yield a heavy crop in July. Whether given as green food or converted into hay, it is eaten with avidity by cattle, who have in various instances, manifested their preference of it to the common sorts, which is accounted for by its superior succulence and softness. It brairds much quicker than any of the other species of rye-grass known to us, arrives sooner at maturity, and is in every respect superior to all of them. As it overpowers clover if sown with it, it is useless to sow them at the same time, and the only chance of their doing well together would be on poor soil, where the vacancies between the tufts of rye-grass might be filled with clover, to be available in the second or third mowings. It is sown in the usual way after a harrowing, and covered with a bush harrow and roller, and the quantity of seed for clean ground is about one stone and a half per statute acre. Among its other good qualities it is found to withstand the influence of frost, if sown late, better than any other varieties of rye-grass. In a word, it is a decided acquisition to our agriculture.

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* Boswell's Treatise on Irrigation.

LEASE.—(See *Covenants.*)

LEY, LEA, or LAY—Land in the state of sward, or grassy surface.

LIME—One of the earths, and usually combined in its natural state with carbonic acid. Wherever there is none of this earth either naturally or artificially in the composition of any soil, infertility, more or less, is the consequence.

Lime, in the purest degree, is obtained from stones and shells when reduced by the action of fire into the soft, white, friable substance in which it is so familiar to us.

Limestone is of very various qualities, and of three distinct orders of rock stratification; but the most common kind used for manure, is greyish, or bluish, and often streaked with red. That which contains magnesian earth is the least valuable; for magnesia, in combination with it, is said by Sir H. Davy to be injurious to land, if the lime be applied in a *caustic* state, (not, however, if used even thus in very moderate quantities;) but when it becomes carbonate, (the state in which lime is usually applied to agriculture,) it is not prejudicial in any degree, as the carbonic acid gas has the property of neutralizing the noxious qualities of magnesia.* Limestone, generally, is valuable in proportion to its hardness; yet lime made from chalk, which is of a very soft nature, is in some places preferred, but probably from mistaken prejudice. Lime in combination exists to a great extent, both in animal and vegetable substances; it enters into the composition of earths, bones, the eggs of birds, and into plants. It is found in the straw of wheat especially, in other cereal grasses, and in some leguminous plants.

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* In a mild state, magnesia is said to be a useful constituent of soils, and a certain destroyer of sorrel. Magnesian lime is serviceable to peat.

Lime, when in process of calcination, loses the carbonic acid gas with which it had previously been combined, and then becomes capable of absorbing water, in which state it is termed a *hydrate*;* it subsequently recombines with carbonic acid gas, absorbed from the atmosphere,. and becomes what is termed carbonate of lime, in which state it is ordinarily applied to the purposes of husbandry, and usually contains a fraction more than 99 per cent. of carbonate.

From a table (published a few years ago by Mr. James Carmichael of Raplock Farm, Stirlingshire, in his Prize Essay on the Principal Limestone Quarries of Scotland) giving a comparative view of 57 limestone quarries, it appears that thirty-eight of them yield 99 per cent.; nine, 98, (we omit fractions;) four, 97; two, 96; one, 95; one, 94; and one, only 55 per cent. carbonate of lime.

The lime produced at the quarry of Arden is of comparative worthlessness as manure for land, but it has the property of cohering firmly without sand, even under water, and is prized exceedingly by the architect;—the residuum of this is principally argillaceous matter.

The pulverized matter scraped from the roads, of which limestone is the material, is carbonate of lime; and this having never been burnt, and consequently without any of the caustic or acrid qualities of lime which has been in a *hydrate* state, may be applied safely in any quantities. This pulverized limestone is, however, so inferior to that which has been calcined, that it is very doubtful if any of the suggestions for reducing it to powder by crushing mills—even in districts where fuel is costly—are to be recommended. It appears that a mill was erected in the Highlands of Perthshire, at the instance of Lord Kaimes, to reclaim some of the forfeited estates; but from want of a spirit of improvement, the manure was left unpurchased, and the mill was swept away by a flood before any profitable results were ascertained. It is considered by competent authorities infinitely better to burn the limestone at any cost of fuel, than to adopt the other process, although powdered limestone, where it can be had without the expense of labour in reducing it, is admitted to be one of the most efficacious manures, especially in soils naturally devoid of calcareous substances.

It was not until the year 1755 that it was proved by Professor Black, "that limestone, and all its modifications, marbles, chalks, and marls, consist of a peculiar earth united to an aerial acid; that the acid is given out in burning, occasioning a loss of more than forty per cent., and that the lime in consequence becomes caustic."* Lime is essential to the fertility of soils, and the nourishment of various plants, and in proportion to the deficiency of a due proportion of calcareous matter in natural combination, should be the supplemental quantity artificially introduced.

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* A term derived from a Greek word, which signifies water.—M. Doyle, Jun.

Limestone gravel consists of masses of stones, pebbles, and sometimes of slate and ragstone, which, when spread upon the earth, and mixed with it, gradually disunites and fertilizes the soil according as the gravel becomes decomposed and intimately blended with it. It is common throughout many parts of Ireland, and in some of the English counties, but it is not generally known in Scotland.†

Lime-kilns.—These are built of brick and stone, the inside being lined with the former, which stands the heat better. The form of the outside is usually square, and that of the inside like that of an egg, both ends of which are cut off, and having the smaller extremity downwards. There is with this construction a greater degree of heat obtained from a given quantity of fuel than from the old-fashioned kilns made in the shape of an inverted sugar-loaf. There are from one to two or even more apertures at the bottom, according to the size of the kiln, and adapted to the local facilities of admitting air sufficient for combustion, and drawing out the calcined material. These apertures are small inside, gradually increasing in their width towards the outside, where the lime is discharged by a drag or shovel. By having more than one vent or *eye*, as it is vernacularly termed, the quantity of air to be admitted can be regulated according to the force of the wind, and the interior circumstances of the kiln. The mode of filling the kiln, is as follows:—faggots are laid at the bottom, and over these, layers of stones broken to a small size, with culm or small coals interspersed, until the kiln is filled. Fire is then applied below, and the stones subside, as they necessarily must in the course of burning, in a perfectly calcined condition; they are drawn out usually twice in the twenty-four hours, and a fresh supply of stones and culm is placed above. The average quantity of culm being one ton to seven tons of stone; it is desirable not to have the coal too fine, as it checks the circulation of air through the kiln; when coal a little round can be obtained, it is the most productive and cheapest in the end.

Within a few years deep elliptical kilns have been contrived with moveable covers and dampers for protection during storms. When it is desirable to keep in the heat, without burning away the fuel and calcining the stones, the apertures above and below are closed. This obviates the loss which would be occasioned by letting out the kiln when any interruption to the demand for lime occurs, and it is intended to resume the burning immediately afterwards.

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* Davy's Agricultural Chemistry.

† British Husbandry.

The best constructed limekilns in Scotland are probably those of C. G. Stuart Menteith, Esq., of Closeburn, in Dumfrieshire, which are especially calculated for economy of fuel; these are of the oval form, widening gradually, and contracting again towards the top. The diameter does not exceed fifteen feet at the widest point, and contracts to five feet at each end. The height is thirty-three feet; more than two-thirds of the contents are drawn from Mr. Menteith's kilns every day, whereas the large circular kilns yield but half their contents in the day, and require considerably more fuel.

In these narrow-mouthed kilns the stone and coal are put in by measure, so that the lime-burner may accurately proportion the one to the other. The stones are put down in courses from 12 to 16 inches in thickness, and then the coal is added, and the proportions depend upon the strength of the coal, or culm, and the hardness of the stone. Mr. Menteith introduced grates in his kilns, from 12 to 18 inches asunder, for the admission of a freer circulation of air from below to the top, and to prevent unburnt limestone from being drawn out; but it is better to describe this in the words of Mr. James Carmichael of Stirlingshire, who has also published a prize essay for the Highland Society, on the principal limestone quarries in Scotland.

> "Two iron bars, 3 inches in the side, and 5 feet long, are placed 5 feet from the ground, in the bottom of the kiln, equidistantly dividing the circle of the bottom. Over these, other 5 strong bars are placed, fixed on pivots at one end, and left loose at the other, so that they can be moved nearer to or farther from each other at pleasure. In filling the kiln, the limestone and coals are placed on these bars, and the whole kiln filled up in the usual manner. The fire is then put on a grating about 3 feet under these bars, and 3 feet are allowed under this, for an ash-pit, which keeps the ashes quite separate from the lime. The ashes are sold at 2s. 6d. per cart, for top-dressing land, and held in high estimation for meadows; shuts are made to fit both ash-pit and furnace, which enables the attendants to temper these at pleasure. The bars also serve to regulate the falling down of the lime, without closing the kiln-eye. The other parts of the kilns are equally novel, and may be compared to two cones, united at their base, being widest at the centre. The top and bottom diameters are 5 feet, the centre 15, and the depth 33 feet. A blast-pipe has just been added, to hasten the combustion, and is to be supplied with air by a movement from the water-wheel."

The arrangement for raising the stones from this great quarry is, like every thing else at Closeburn, creditable to the ingenuity and good management of the excellent proprietor. The same wheel which turns the machinery for raising the water, brings up and takes down alternately, on a railway, full and empty waggons.

The improved kilns should be lined with fire bricks of the best quality, which last considerably longer than any stones, and retain the heat longer. Mr. John Wallace of Mansfield House, Cumnock, in Ayrshire, who has published an admirable essay on the method of calcining limestone, for which the Highland Society awarded him a medal, states that the advantage which the Closeburn kilns have over those commonly employed in Scotland, is as three to two.

Booker's conical and revolving cover, when it is desirable to retain the heat, is put on the mouth, and there is a cast-iron door at the bottom, so that the burning can be stopped, and yet the fire kept in for several days. Mr. Wallace gives a simple and intelligible statement of the alteration of a kiln of the common construction, to that of Mr. Stuart Menteith's. It is very simple; a lime-kiln at Mansfield, eighteen feet wide at top, three or four at bottom, with three eyes, was altered thus:—the front eye was built up, and the bottom of the kiln widened to seven feet in diameter, in which a mid partition was built to the height of four feet, and upon which the mid bar of four-inch square iron rests; another bar of the same size was fitted into the wall on each side, upon which four bars on each side of the partition, of one and a half-inch iron, rest, and fixed to the mid bar by a strong, moveable nail, to support the lime in the kiln. This kiln is only ten feet wide at half-way up, and eight at the top, and lined with bricks about fifteen feet deep. A saving of one-fourth of fuel in burning a given quantity of lime has been the consequence; and it will give out a greater quantity of lime-shells in twenty-four hours, more equally and better calcined, and with less labour to the lime-burner, than any ordinary kiln in the county of Ayr.

Booker's lime-kiln is of an oval form, twenty-two feet high, two feet wide at the bottom, nine feet in the middle, and gradually contracted to three feet at the top. It is lined with brick, and instead of being covered with a dome, Booker adopts a cover of cast-iron with a vent in it, which cover is placed on a ring of three feet in diameter, built into, and fixed on the top of the kiln. The cover, by moving on a pivot, is easily removed when the kiln is to be charged, and being put on during the process of calcination, it both increases the draught of air through the kiln, and by acting as a reverbatory furnace, is attended with a considerable saving of fuel.*

A great deal of limestone is burnt in the south and west of Ireland without a permanent kiln; a rude bank thrown up in a temporary way, on the side of any abrupt elevation of ground, answers the purpose of a regularly constructed building.

In parts of the county of Roscommon, where labour is remarkably cheap, a country mason will undertake for fifty shillings to produce five hundred barrels of the best lime.

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* Dumfries Report, p. 594.

"This is effected not by a drawn kiln, the erection of which is costly and gradual in operation, but by what is termed, an *arch-kiln*, cheaply constructed, and expeditiously worked. In many parts of Ireland (where it might be usefully adopted) it is altogether unknown.

"It is a square building in the side of a hill, with one front, at the bottom of which are two apertures of perhaps three feet high by two feet wide, with an arch turned over each.

"In packing the kiln the work commences by the mason turning at the bottom, across the interior, two arches of rough stones, corresponding in size and height exactly with the arches described in the front wall of the kiln. This being done, he proceeds to form arches over these, but without any chamber, and packed as close as the unhammered and unbroken stones will admit, and so on, with a succession of those solid arches, till the entire kiln is thus filled.

"In this the labour is saved of the minute breaking of the stones necessary for kilns of another description, as those which are used in this may be of any shape or size that the workmen can most easily manage.

"The next operation is to light fires in the under arches (by means of apertures in front) consisting of furze and turf, and to keep up those fires, by the constant throwing in of fuel, by raking out the ashes through the whole extent of the arches, and by never intermitting, night or day, to keep up a full and equable heat in the two furnaces.

"This will require a relay of hands; but those who labour by night may rest by day. In the course of three days and nights, the work will be completed. The mason must have two assistants to supply the fires, and men to be relied on for care, when he takes his repose; and, however moderate the sum of fifty shillings may appear, it will, in a cheap country, pay good wages for the time occupied.

"If the kiln is to be kept over, it is usual to cover the kiln with a temporary roofing of rough timber and thatch, and to draw out the roche-lime, as required, at the arched openings in front; it will sink by its own weight, and being perfectly burned throughout by pure flame, will yield a quality of lime superior to that which is interspersed with layers of culm or other fuel.

"If the materials be contiguous, their value at the kiln in a sufficient supply for the quantity mentioned may be about £2 10s.—mason's charge by task, £2 10s. Total, £5. A fraction less than two-pence-halfpenny per barrel of twenty-one gallons."*

Well constructed kilns are, however, now to be found in almost every part of Ireland, though, in the districts here referred to, they have not altogether superseded the ruder kiln of the natives.

Limestone Quarries.—The expense of raising limestone when it lies at a great depth from the surface is much increased by the necessity of removing the rubbish which falls in from the sides during winter, when the action of the water, which accumulates during that season, undermines the sides below, and causes them, from the superincumbent pressure, to slip. It is prudent, therefore, to make a considerable breadth of opening in the first instance, if the quarry is to be worked during succeeding years, to relieve the sides from the pressure which would otherwise occasion their collapsing, by forming a series of terraces from within a few feet of the rock to the top. This will prevent danger to the workmen, while it may obviate the necessity of much subsequent labour at an inconvenient and unexpected period.

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* Martin Doyle's Address to Landlords.

LOAM.—By this is understood, dark-coloured, rich mould, principally composed of dissimilar particles of earth and decomposed vegetables, moderately cohesive, and therefore neither retentive of moisture, like clay, nor too ready to part with it, like sandy soil. According as the different ingredients predominate, loamy soils are of different qualities, friable and mellow, middling, or heavy loams.

LOY.—A very long narrow spade, peculiar to the province of Connaught and some parts of Munster, and only suited to stony land, where a wider edge could not so easily penetrate.

LUCERNE.—An artificial grass, called by the French, *grand trefle*, and affording a larger produce than any other sort of the artificial grasses familiar to us. The root is perennial, and in deep, loose, dry soil—that which alone is suited to it—it will in the course of a few years push its fibres to the depth of some feet. The annual stalk rises in good ground to the height of three feet, and will bear repeated cutting during the summer season. It flowers in June, and seeds in September. There are several varieties in the flowers, but those which are of a purple colour indicate the best plants for cultivation.

In France and Switzerland, and other parts of the continent, lucerne has long been a great favourite; but it is by no means of general or even increasing cultivation in Great Britain or Ireland, our soil generally, and climate invariably (excepting that of some of the midland counties of England) being more adapted to the growth of clover. Besides, the rotation of crops is interrupted by the introduction of lucerne, which must have a permanent establishment in the soil to render it truly profitable.

In rich, dry loam, however, or on any land dry enough for turnips to be eaten off the land, if there be a sufficient depth of soil, lucerne will be found, *on a small scale*, and merely for soiling, the most valuable of productions. It should never be sown on wet, clay land—there it will always disappoint the cultivator, who will find clover, if he drains or ridges up his land properly, infinitely superior to any other artificial grass. The great matter is to have a dry basis for it, whether it be chalk, dry friable marl, or gravel. The land should be well prepared and perfectly pulverized for the seed, which should be fresh, and sown in April or May, without a corn crop, and in drills. These may be from twelve to eighteen inches at the discretion of the cultivator; the object being to allow sufficient room for weeding between the rows, as the top-dressing, which should be put on lightly every year after the first or second cutting, will produce weeds, and the indigenous grasses will endeavour to possess themselves of the surface, and the intrusion of these must be carefully prevented.

If the rows be eighteen inches asunder, the quantity of seed should be eight or ten pounds, and about two pounds more if the distance be twelve inches. We prefer the interval of eighteen inches, provided that the drills for the seed be broad, so as to give an abundant breadth for the plants. The best way is to form them with a common shovel, about twelve inches wide, and to scatter the seed over the entire width of the furrow, which the shovel marks out. For broad-cast sowing—which we deem very objectionable—eighteen pounds will be required.

In order to have the ground in the cleanest and most friable preparatory state, it should have been either under turnips or cabbages, &c., (naked fallowing, on such land as is required for lucerne, would be extravagantly wasteful,) carefully hoed, and well manured. In very light land, not likely to produce a heavy crop of corn, barley may be sown (rather thinly) with lucerne, and perhaps it may serve the plants by moderately shading them; but in rank soil, where the corn would lodge and overpower it, lucerne should have sole possession.

The broad-cast method, it is right to state, though we ourselves are opposed to it, has had strenuous advocates in England, and has had there the principal extent of practice, even among those who in many other instances admire drill-husbandry. They wish to avoid the expense of weeding, and depend on severe harrowing for keeping the crop clean. As a kind of compromise between those who maintain the superiority of broad-cast sowing, and the others who prefer eighteen-inch drills, Mr. Arthur Young recommended "drilling at nine inches, which, in point of produce, mowing, and freedom from dirt, is the same as broad-cast; and another advantage is, that it admits scarifying once a year, which is much more powerful and effective than any harrowing; * * nine-inch rows might *practically*, but not literally, be considered as broad-cast, but with the power of scarifying."

The hoes or coulters of the scarifier can certainly be set at nine-inch distances, and critically move in the intervals. Where manual labour is preferred to that of complex machinery, the triangular-shaped hand-hoe will effectually clear the crop, and this should be used whenever weeds appear.

In rich land, lucerne will yield five crops; an average of four, on reasonably good ground, may always be expected, and the weight of produce is much greater than that of clover; it will also be fit to cut sooner. If it lodges, it must be cut with the sickle; but if it stands up, the scythe is more expeditious; and in a dry summer, the cutting should be twice a day, if the distance be not inconvenient, as there is injury done to it by keeping it even for a few hours.

The principal advantage of lucerne, as of clover, is from soiling with it, for it loses half its weight in hay; but if there be an overplus, it makes fodder of superior quality. In moist weather, care should be taken not to give too much of it to cattle, which may be *hoven* with it as with clover. Where the proportion of land is *small*, and *suited* to lucerne, and the quantity of stock disproportionably large, and on dairy farms particularly, it is well calculated for the purposes of the economical farmer. If there be neither clover nor lucerne for supporting cows, increasing the quantity of milk, and maintaining the working teams in summer, woe betide the farmer.

About 80lbs. weight, per day of 24 hours, is sufficient for the largest cow, and half this for a horse.

No beast should *at any time* be permitted to graze upon it.

LEGUMINOUS PLANTS—(from *legumen*, pulse) are those of the pulse tribe, and include peas, beans, tares, clover, potatoes, turnips, cabbage, &c. &c.

The formation of the roots of leguminous vegetables vary much. The pea and the cabbage, for instance, have numerous small roots, all issuing from the seed, like the under set of the roots of culmiferous plants; the potato has a bulbous root; and the red clover a strong tap root.

Leguminous plants abound in foliage—some more, some less—and many of them (for example, cabbages, clover, lucerne, saintfoin) are cultivated for their leaves alone; carrots, and parsnips, and some others, for their roots only; while a third class, such as beet and turnips, yield a two-fold return—both leaves and roots.

The essential difference—as regards the effect upon the soil—between leguminous and culmiferous plants, is, that the former derive much of their aliment from the air, through their leaves, while the other, having small and few leaves, depend chiefly on the soil for their nourishment. During the ripening of their seed, they probably derive all their support from the soil, as the leaves, at that period, being dry and withered, must have lost their power of drawing nourishment from the atmosphere; and, as culmiferous plants are chiefly cultivated for their seed, and are not cut until fully ripe, they must be considered of an exhausting nature, though in different degrees. When, however, they are cut green for fodder, they do not weaken the vigour of the soil more than many leguminous plants. While young they are principally leaves, and, therefore, feed principally on air. Bearing this distinctive principle in mind, it follows, as a necessary deduction, that leguminous plants weaken the land, more or less, according as they ripen their seeds or not. Peas and beans being grown for *seed*, are more severe than other leguminous crops cut green. But, whether they ripen the seed or not, they are all, in one respect, highly conducive to the friability and mellowness of the soil; by the shading which their foliage affords, the dew, or the rain which falls in summer, is greatly prevented from evaporation; much of the moisture sinks into the soil, which becomes mellow and unctuous in consequence; but moisture falling on a culmiferous crop, rests but for a moment on the surface, and is then evaporated by the influence of the sun, leaving the ground not only dry but *hard;* and farther, some of the leguminous tribe, by pushing their roots widely and deeply in the ground, loosen it more than others, and are, of course, in this respect, more beneficial than others, though, in respect of abstracting aliment, they may be more injurious. Potato and cabbage roots, by their size and number, divide and pulverize the soil in a great degree; but these yield again to the carrot and parsnip, which push their tap-roots to the depth of twelve or eighteen inches. Red clover by its tap-root divides the earth more than any mere fibrous-rooted plant; and when it does not mature its seed, is on clay soil the very best aperient, as it tends to remove cohesiveness without exhausting. In a word, leguminous plants, if not allowed to ripen, deprive the soil in a very trifling degree of nourishment, while they invariably loosen it, and prepare it best for those culmiferous plants, which are perhaps more profitable, to succeed in their proper turn, and which tend to bind up the land again, (which in loose and porous soils would become too loose,) and thus preserve the happy medium of fertility.

MANURES.—No effort is intended here at a philosophical disquisition upon the chemical properties of manures. Nothing will be attempted on the subject but what is plain, practical, and concise; and to those who seek more elaborate and scientific information, the able works referred to in a note are especially recommended.*

Some acquaintance with the principles of agricultural chemistry is unquestionably as useful as it is interesting and amusing to the mind of an educated and reasoning man; but it is by no means indispensable to the mere practical farmer, and a *smattering* of the science has often led the theorist into woeful errors of management not likely to occur to the more humble practitioner in husbandry. Indeed theory is often carried to the verge of the ridiculous—for example, the discovery of a celebrated French chemist, that there is a remarkable difference between the dung of cocks and hens, and even a distinction between that of hens which lay and those which do not lay eggs.

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* The Code of Agriculture, British Husbandry, Davy's Agricultural Chemistry, and Low's Elements of Practical Agriculture.

An enthusiast in science may in this way carry his pursuit to an extreme; yet it is not to be understood that there is no use whatever in his experiments and deductions, if they be correct; these may be highly important as stepping-stones to high and important discoveries. We only mean to argue, that for *ordinary* purposes and ordinary persons such distinctions as those of which an illustration has been just given, are not of any practical use.

But it is useful to know by what management in general, putrescent substances may be most easily accumulated on any given farm, and rendered most beneficial in their effects upon the soil as regards its productiveness, and how *lime*, the principal of mineral manures, may be most profitably applied.

Manures, following Low's simple classification, are—

1. Animal and Vegetable Manures.
2. Mineral Manures.
3. Mixed Manures.

1. *Animal and Vegetable Manures.*—The constituent parts of all plants are found in these manures, which contain within them all the *elements* of vegetables, though in very different states of combination from those in which they exist in the living plant; yet, they *do* exist, and afford the substance by which the growing vegetables are nourished.

"Science has made known to us the truth, that the living plants and the dead manures are resolvable into the same elementary substances." The uneducated husbandman does not know or comprehend this; but he perfectly understands—what comes to the same thing in point of fact—that by combining these manures with the soil, that degree of fertility is imparted to it which causes it to produce those plants, and he knows from experience that animal and vegetable manures, or putrescent manures as they are also called, are those which supply the soil with the principal sources of fertility.

The late Lord Erskine, at an agricultural dinner at Holkham, several years ago, thus forcibly and elegantly expressed himself on this rather *in*elegant subject.—

"If we only consider the subject of manures, we shall perceive one of the most striking bounties and benefits of the divine ordination and wisdom, with which we are blessed in a thousand ways without our knowing it. This very substance, the refuse of every thing, had it been useless, must have accumulated in heaps, intolerably noisome, and perpetually pestilential; but by the blessing of Providence, it is every man's interest to remove these otherwise increasing mountains of filth, and by decomposition, in various ways, concealed in a great measure from us, it gives increase to our fields, and adds to the means of industry and the reward of the husbandman."

The very effluvia which we perceive from the decomposition of animal or vegetable matter around us, should be a hint to us that something is going to decay which, by the order of Providence, may be rendered reproductive to us, and should be turned to advantage accordingly.

Farm-yard dung is the principal of the first class of the manures enumerated above, being composed of the excrementitious matter of cattle, and straw and other vegetable substances. This is more or less fertilizing according to the nature of the food of the cattle. Those fed on potatoes, turnips, and succulent grasses, and above all on oil cake, produce manure of far richer quality than is obtained from the dung of cattle fed on straw. The manure of swine is still more rich, from the nature of the food which they use, this being of the most nutritive vegetable kind, and often mixed with animal matter from the kitchen and the dairy. In a heap of farm-yard manure there is also a good deal of purely animal substance; blood, the excrement of dogs fed entirely on flesh, the bodies of dead animals, and various substances of the same nature, tending to render these mixed manures highly putrescent. Nor should urine be omitted as a principal ingredient, which, when pure, is too powerful for absorption by the roots of plants, but when mixed with other matter is highly fertilizing. The economy which the Belgians exhibit in providing urine-cisterns to collect all the fluid from their stables and cattle-sheds is truly admirable—none of it is wasted. These cisterns are constructed regularly by bricklayers, at a price proportioned to the number of hogsheads which they are designed to contain. The usual capacity being for one thousand hogsheads of thirty-eight gallons each.

"The cistern is for the most part formed under the range of stables, from each stall of which the urine is conducted to a common grating through which it descends into the vault; from thence it is taken up by a pump. In the best regulated, there is a partition in the cistern, with a valve to admit the contents of the first space into the second, to be preserved there free from the later acquisition, age adding considerably to its efficacy."*

Nor are tanks for liquid manure confined to Flanders; they are very common in Switzerland, where they are merely square holes a few feet deep, lined with bricks, in clay mortar, with wooden covers, and small openings for the purpose of throwing in any *valuable* addition, such as a dead cat or dog, &c. &c.; and all the cattle-houses have channels to convey the urine to the tank. Mr. Radcliff well observes—

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* Radcliff's Agriculture of Flanders.

> "May we not then press it (the adoption of the cistern) upon the notice of farmers of the British empire? In England and Ireland it is little known; in Ireland not at all. Where farm-offices are to be erected, the additional cost of forming them upon vaults, and regulating the flagging or pavement so as to supply those vaults, would soon be repaid by the advantage of the best kind of manure, which at present is universally suffered to flow away in waste. Even to offices already built an exterior cistern might be added; but it is essential that it should be secured from the admission of rain, or any other water. If once connected with a regular soiling system, the increase would embrace an infinitely wide extent."

Liquid manure is of the utmost value, both in stimulating the growth of plants, and in fertilizing the soil; and yet in no particular of our husbandry is there such wasteful extravagance.

The great secret in the Flemish system is, to collect and concentrate fluid manure, by means of tanks or pits, and this, when *enriched* by the other substances already noticed, converts the lightest and poorest soils into rich mould, and makes them produce heavy crops of wheat, the growth of which is ordinarily confined to clay loam; and the largest farm may be manured by liquid manure, as well as the smallest, by having a sufficient number of cattle, and tanks in proportion!

It would startle a farmer of 400 acres of arable land, if he were told that he should constantly feed 100 head of cattle; and yet this would not be too great a proportion if the Flemish system were strictly followed.* The waste of liquid manure so unnecessarily permitted in *our* great cities, whence such vast supplies might be obtained by a proper system of economy, is illustrated by the author of the admirable tract last referred to. He remarks,

> "The total ignorance or disregard of the power of urine on vegetation cannot be better shown than by the fact, that a large cow-keeper near London, having built a reservoir for the urine of several hundred cows, thinking to make some profit by the sale of it, found so little demand for it at a very low price, or even for nothing, that he destroyed the tank, and let the urine run into the common sewers, to add to the varieties of rich impurities which daily flow into the Thames. A gentleman from Flanders, to whom this was mentioned, asserted that, in his country, there would have been many applications to contract for all the urine, at the rate of £2 per cow, per annum, a sum which would have amply repaid the cow-keeper for the expense of his tank, and put a large annual sum into his pocket. It is not that *gardeners* are not aware that urine is a rich manure, but they want experience in the management and application of it, and *every* Flemish farmer

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* Outlines of Flemish Husbandry.

could teach him this, if he would, and a few experiments, with common attention, would enable *any* intelligent man to find it out himself."

Rape Cake is dissolved to a vast extent in the liquid; and with this, and highly putrescent manure obtained from six or eight horses and thirty or forty head of horned cattle, the Flemish farmer will manure perhaps twenty English acres annually. Nor are the contents of *certain offices* allowed to run to waste—this matter, combined with the urine, is the most powerful and valuable of their manures.

When designed for meadows, the best time for applying the liquid, which is sprinkled from a cart similar to those used for watering the streets of our principal cities, is in the spring when they are laid up for hay; if manured sooner, the land will be useless for cattle, which dislike the salts deposited on the blades of grass.

Unless the reservoirs for the urine be secured from rain, it is better to put out the liquid in dry weather, when it has not lost any of its ammoniacal salts or other essential qualities by too much dilution from atmospheric moisture.

On the proper admixture of the substances composing farm-yard manure, much of the excellence of the compound depends. A mass of horse-dung, for example, which is of a very hot and acrid nature, and ferments to excess and consequent waste, should be mixed with colder substances—cow-house manure, weeds, peat, earth, or other vegetable mould, which it will decompose and convert into elements of fertility. The best plan is to have the various manures, as they are brought from the stables and sheds, placed with the scrapings of roads, scourings of ditches, &c., in layers on each other, in the centre of the yard, which should be hollowed, and if of a porous nature, flagged or bedded with marl, and with a thick stratum of peat (or any vegetable matter to imbibe the juices) immediately over it, and with the urine channels from the surrounding cattle-houses declining towards it, so that the defective qualities of one kind of manure may be corrected by the opposite qualities of another. Where there is no other than stable manure, this should be carted out before it has fermented to excess, while it retains its ammoniacal juices and other gases, and mixed with earth in the field where it is to be applied—suppose on a headrigg, (or headland as it is termed in Ireland)—by which none of its excellence is lost, and a mass of vegetable mould is rendered a fertilizing compost; or earth, or the scouring of ditches can be carted on the dung, or shovelled over it in layers as each successive supply is brought out, until the heap is three or four feet high; and if dung from different animals (previously unmixed in the farm-yard) is to be taken out for the field-compost, it should be taken alternately from the stables, cow-byres, hog-sties, &c., and mixed judiciously. The layers of weeds, road-scrapings, &c., ought not to exceed three or four inches in thickness, (and this rule especially applies, if the intervening layers be clay,) else fermentation will not penetrate them, and when the turning of the compost takes place, this earth will be in undissolved clods, requiring much trouble and labour in breaking and pulverizing; besides, two or three turnings of the compost may be necessary in consequence of this condition of the earthy ingredients; and as a new fermentation is the consequence of each turning, the fluids, and other essential qualities of the manure, may be wasted before it is applied to the ground in which it ought to have the unexhausted power of fermenting, else it loses one of its principal means of operating.

The layers of earth, therefore, should be scattered over rather thinly with shovels, and in proportion to the time during which the compost is to remain together; for if these layers of cold substances be *too* thin, fermentation may proceed too rapidly in the heap, and the best parts of the manure may evaporate. If the substances of the compost be judiciously proportioned and blended, they may be sufficiently incorporated in two months; but if the heap be not required for four or six months, a thicker covering of unfermented earth in the first instance is desirable. It is to be especially understood that more than a moderate degree of fermentation in the mass is wasteful; the loss of dung in weight by excessive fermentation is very considerable; and at the same time there is a loss of fluids which, if introduced into the soil, would afford useful nourishment. A watchful farmer will take advantage of frosty weather to perform as much of this work as he can; and after mixed kinds of farm-yard manure have been thus collected in a sufficient heap, it should be covered over with clay previously laid by the sides of the heap, so as to make a neatly crusted *pie* of the whole mass, to remain during the winter and early spring months in this state, without loss by exhalation, until within a few days of the time when it is required for potatoes or turnips; and then it should be turned carefully, so as to blend the crust, the sides, bottom, and dung completely together, and there should be a light covering of loose earth from the adjacent furrows of the fallow where it stands, to absorb the evaporation, and cause a slight fermentation.

When spring advances, there will not be time for the collecting of these pies, unless perhaps for a late turnip crop; the hot stable-dung must therefore be scattered in layers through colder manures in the farm-yard, to prevent it from being burnt or becoming *fire-fanged*, as it is termed in Norfolk, (by which it loses half its value,) or applied in its fermenting state to potatoes, for which fresh dung answers extremely well, though short dung or muck, or spitdung fully putrified, is necessary for the quick-growing turnip, which requires immediate nourishment; but under no circumstances ought it to remain in a heap by itself.

For *pie-meat*, as it is called in Norfolk, which is rather an Hibernian expression by the way, as this meat is the *vegetable* material of the dung-pie, Mr. Blaikie (in a pamphlet addressed to Mr. Coke) recommends old turf (sod) "turned up for a year preceding, on wastes by the sides of roads;" his reason for suggesting that the turf should lie for a year before it is incorporated with the compost is extremely judicious—namely, to get rid of worms, grubs, &c. &c., which generally select for their location "dry old pasture-wastes by the sides of roads, old hedge-row banks, &c.; and they very seldom select land kept in aration," or turned up by the spade; it is desirable therefore to serve them, through means of a plough or spade, with at least twelve month's notice to quit, else they would enter the compost along with their native soil, and introduce there, and consequently into the land afterwards, themselves and their myriads of embryo flies or grub-worms, to the great injury of turnip crops in particular.

What a vast quantity of putrescent manure is lost by mere carelessness, which, if collected in a cistern, a tank, or any well-contrived receptacle for urine and muck, and properly combined with weeds, the scourings of ditches, garden waste, &c., would be profitable to the poor cottager, who ought to be economical of the dirt and filth which too often cleave to his condition of life, and render them, by his industrious management, the means of increased subsistence for his family, and contradictory as it may appear at first view, conducive to cleanliness, comfort, and good order in his little establishment.

In the class of putrescent manures, *bones* (which are but partly animal substances, having 50 per cent. of phosphate and carbonate of lime in their composition*) now hold a very prominent place, and must be here particularly noticed.

The best mode for preparing bones for the soil, is by grinding them in a mill to dust, in which state they will at once blend with the particles of earth, and stimulate to productiveness; the fresher they are the better, as the oil and marrow are the most fertilizing components. Many farmers merely crush bones with one, or two, or more sets of rollers, turned by horse or water power, to different sizes—inch, three-quarter inch, or half inch; "but the greatest demand is for those of the half inch size, which contain all the dust which has been formed in crushing them."†

A farmer who has no machinery can employ labourers to pound bones; and when labour is cheap, and no pressing necessity for its application to more important matters, it may be well worth his while to employ them in this way if he can procure a supply of bones; many an idle cottager's family might be occasionally occupied at home in bruising bones, (which are often allowed to bleach for months in the open air, heedlessly thrown away,) either for sale or their own garden purposes.

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* To the combination of phosphoric acid with lime, the peculiar properties of bones as a manure are attributed.

† British Husbandry.

The application of bone-dust is only recommended for dry or calcareous soils, and is considered totally inefficacious on heavy clay lands, though there are assertions to the contrary. On shallow soil it is highly serviceable. On the wolds of Yorkshire and Lincolnshire the bulk of turnip crop has been increased by it in a wonderful degree, and the succeeding crops of corn have benefited in a corresponding ratio.

Mr. Watson of Keiller, near Cupar Angus, has been in the habit of growing from seventy to one hundred acres of turnips every year with this manure alone, reserving his farm-yard dung for other purposes. He was led to this practice from observing the decided superiority of turnips manured with bone-dust, over those raised with dung. This gentleman erected a mill in 1823 for grinding bones, (the cost of one of these varies from £100 to £200,) and in the first year sold bone-dust to the value of £1500. In 1827 the sum of £10,000 was paid for bone-dust in the district of Strathmore alone.

A great number of facts has been adduced in the Doncaster Report,* to prove the superior excellence of bone-dust, as compared with farm-yard, for turnips on *light* loams and *peat soils* in particular, thoroughly drained and dry. What a field of enterprise is here opened for the introduction of turnip husbandry on the mountain bogs of Ireland which can be so easily drained, and to which the application of any manure of large bulk would be impracticable! Nor is the efficacy of this manure confined to the turnip crop alone. The succeeding crops of grain or grasses are improved by it in a surprising degree, not to be attained by the ordinary putrescent manures. Mr. Watson testifies to this effect, and also to the earlier vegetation of grasses on land which has been manured with bone-dust for the turnip crop. There is a peculiarity in bone-manure worth noticing, viz., that no increase of quantity beyond a sufficient portion, averaging twenty bushels of dust, or twenty-five of half-inch bones to the statute acre, will make any perceptible difference in the immediate crop, but as may be supposed, the effects of a larger quantity during a long succession of years will *tell;* it appears that a great quantity does not force the crop more than a small one, if it be sufficient to afford the gradual and necessary supply of nourishment to the plants as they require it.

The most approved method of applying bone-manure, when in *dust* is through two additional hoppers and spouts to the turnip drill-machine, which deposits the seed and the manure at the same time. These drill-barrows cost about £8 each. When crushed bones are used, they are scattered broad-cast, and harrowed or lightly ploughed into the ground before the sowing of the turnip seed. It is very important that the bone manure should be almost in contact with the turnip seed, which has a remarkable appetency for manure in its early growth; and the application of this peculiar manure near the surface fortunately does not occasion its waste in any degree from exposure to the air.

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* British Husbandry.

When in contact with the seed on or close to it at the surface, a quick braird of the plant is insured, and the prompt and vigorous vegetation is probably the cause of the general security of turnips grown with the bone manure, from the ravages of the fly. Under all circumstances, to insure a quick braird of the turnip plants, the manure should be within immediate reach of the young fibres. In the class of farm-yard dung there is an obvious waste *to the soil* when it is exposed uncovered at the surface; (though in this case the turnips will vegetate and succeed best;) but however exposed the other manure may be, no particle of it will be eventually lost; and whenever it afterwards becomes incorporated with the soil by the treading of cattle or any other agency, it will impart to it, its fertilizing properties. Probably there is no practice by which both the immediate crop itself and the soil for succeeding productions, can be so much benefited as by putting a moderate portion of dung, *not too much decomposed*, at such a depth in the drills as will be within the reach of the fibres of the turnips in their advanced stages; and by sowing ten or twelve bushels of the bone-dust with the seed, as the best and most stimulating nourishment for the plants in their earliest growth.

A trial was made a few years ago on the property of Sir William Maxwell, at Calderwood, between dung and bones *separately* applied to turnip culture, on a strong loam resting on a retentive clay bottom, but well drained. In each instance, seven and a half chaldrons of lime to the Scotch acre were given. The quickest and most vigorous brairding was on the dung; but ultimately *bones* had the advantage in point of leaves. In neither instance was there any injury from the fly.*

We would back *muck* or *spit-dung* against *bones* alone, any day for a small bet—say 1000 guineas—and wager the same sum on the superiority of the succeeding corn crop.

It is hard to persuade the farmer who values manure by its bulk as well as its richness of material, that so small a portion of this substance (sixteen or twenty bushels) will of *itself* insure the *successive* crops in a four-shift rotation; yet such we believe to be the fact! (though we recommend the addition of a little dung,) but some experiments warrant the inference that the *repetition* of bone-manure will not succeed until after the lapse of a great many years. The Duke of Portland, in a communication in Bell's Weekly Messenger, April 23d, 1838, thus remarks, after giving numerous and interesting details of experiments, and some failures:—

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* Quarterly Journal of Agriculture.

> "Combining the great advantages of bones on the first application of them, with this failure, it seems difficult to avoid the conclusion, that as the bones, while they are new to the land, have produced the most beneficial effects, and as this failure has taken place where their application has been most frequently repeated, the success is in a great measure owing to the novelty, and the failure to the repetition of their application."

The effects of bone-manure on grass-land depastured by cattle are said to be very great; and from the Doncaster report we learn, that "valuers estimate the allowance to a quitting tenant, by supposing the effect of bones upon tillage and meadow-lands to be exhausted within four years; but on grass-land depastured it is considered to last during eight." The season for applying it to grass-lands is in spring or summer.

Some of the Yorkshire farmers have found it highly beneficial to form composts of bone manure and earth, at the rate of fifty bushels of the former, to five cart-loads of earth, or burnt clay, per acre, or with five loads of farm-yard manure and earth; or bones, and yard muck, with dung, in order by fermentation to decompose the bones.

The following summary of what has been stated above, has been published by the Doncaster Agricultural Association, from which it appears, that—

> "On dry sands, limestone chalk, light loams, and peat, bones are a very highly valued manure.
>
> "That they may be applied to grass with good effect.
>
> "That on arable lands they may be laid on fallow for turnips, or used for any of the subsequent crops.
>
> "That the best method of using them, when broad-cast, is previously to mix them up in a compost with earth, dung, or other manures, and let them lie to ferment.
>
> "That, if used alone, they may either be drilled with the seed, or sown broad-cast.
>
> "That bones which have undergone the process of fermentation are decidedly superior (in their immediate effects) to those which have not done so.
>
> "That the quantity should be about 20 bushels of dust, or 40 bushels of large, increasing the quantity if the land be impoverished; and also, according to our opinion, if the bones have been already manufactured.
>
> "That upon clays and heavy loams, it does not yet appear that bones will answer."

Rape Cake, which differs from oil or linseed cake produced from flax or rape-seed, in having but a very small portion of oil, is composed of the refuse of the rape-seed after being crushed in an oil-mill. Although it consists chiefly of husk and bran, it is a valuable manure, and is applied solely as such. In Flanders, as is already noticed, it is an ordinary ingredient in the liquid manure. The Belgian mode of dissolving rape cake in urine, while it contributes to the power of the liquid, saves a great deal of labour. When not so saturated, it requires much bruising, its hardness being considerable, and in proportion to its disengagement from oil, by hand-mallets, or pulverization by a stone revolving on its edge, as in grinding bark or mixing mortar. Mr. Coke, of Holkham, in Norfolk, the prince of farmers, has used it, with good effect, for turnips, applying it in dust along with the seed, by a drill-machine, but not laying it, we believe, in actual contact with the seed to which its fermentation would be injurious, but with a thin layer of earth intervening, as in the case of bone-dust. Rape cake has also been applied with great effect by the late Mr. Curwen, to *wheat* as well as turnip crops. He recommended the scattering of half the quantity with the corn in autumn, and the other portion between the drills in spring. The quantity which this eminent agriculturist used for turnips was at the rate of 5 cwt. per acre, and mixed with 2 tons of dung. It is not, however, considered beneficial to the succeeding crop—a serious objection to its being largely or generally used.

The nature and properties of rape dust, and bone, have some remarkable points of difference. The former answers but on wet and clay lands, and succeeds only in wet seasons; the other loses (as has been before remarked) much of its utility unless applied in dry weather, and can only be successfully used on dry or calcareous soil, (even on the lightest and most hungry soils it is found profitable,) while rape dust is comparatively useless, on such dry and absorbent land.

In the volume of British Husbandry, several experiments are detailed which corroborate the writer's "opinion of its good effects when applied to strong land, and also the doubts which we entertain of its profitable application to corn crops, which at once absorb its whole benefit—though turnips, indeed, if favoured by the weather, may support the expense, because the success of the future rotation of crops mainly depends upon that one being abundant, and, therefore, a farmer can afford to force it, even although the charge may not be reimbursed by its immediate value." He concludes—"that farmers who have not already tried it, will do well to employ it cautiously at first." The continued practice of the Belgian farmers, however, is a strong ground of presumption in its favor; and if rape were cultivated on our bogs and mosses, to a great extent, as might be easily done, and suitable mills erected, so as to lower the usual price of rape-cake —five guineas per ton—the balance would be in its favour.

Any substance which supplies carbon to the soil, affords food for plants, and though the importance of certain concentrated preparations, such as "dessicated night-soil," and "animalized carbon," may have been sometimes over-rated, as to their effects, they are doubtless highly fertilizing. Animalized carbon, manufactured in Denmark, has been used like bone-dust in many parts of Engalnd, at the rate of 15 cwt. per acre, for corn crops, and 12 cwt. for grass-land. For plants in rows, a handful is put to each, or, if it be mixed with bone-dust or ashes, which render it dry and powdery, it can be sown from a drill-machine. Its great use seems to be in pushing forward the early growth of the turnip, so that it escapes the ravages of the fly.

Malt dust, which is the radicle of the grain after malting, has considerable effect as a manure either for corn or turnips. The usual mode of applying it is as a top-dressing to wheat in March, or harrowed into the ground with barley or turnips. It is scattered by the hand at the rate of forty bushels per acre as a dressing for wheat; and a few bushels less than this for barley and turnips. The dark is preferred to the light-coloured dust as more stimulating. It probably has no permanent effect, and though excellent (if easily obtained) for renovating a sickly crop of wheat, it is probably more profitable as good for swine. Pigeon's dung is truly valuable for all soils and at all times, and should be used like malt dust; but who can command a large supply of it?

Peat or bog earth, from its vegetable character, is an important ingredient in composts. There are two modes of rendering it a manuring substance—mixing it with fresh dung, with urine, or with lime in its caustic state, by thorough fermentation. Combined with farm-yard manure, its sluggish nature is corrected; the fibrous matter with which it abounds is dissolved and rendered fit aliment for plants; but whether it is to be reduced to the state of mould by fermentation in the compost heap, or by the action of lime, the farmer should give it sufficient time to decompose. It will require two or three years with repeated turnings to render it perfect *vegetative mould* by the agency of lime alone; yet it is rarely allowed to lie in the mountain peasant's yard or *bawn*, as the foundation of his *midden* heap longer than nine or ten months. From this cause disappointment frequently follows, the inert vegetable matter is dissolved but in part; or it may be, that the gallic acid, which prevents putrefaction, is not yet disengaged, in which case instead of becoming a source of fertility it is worse than useless.

For top-dressing grass-lands, especially of an argillaceous nature, a well dissolved mass of peat is excellent; but for potatoes or other similar crops, it is a weak, unsubstantial food, though better than none.

Lord Meadowbank's mode of rendering peat a profitable manure is by far the best. His suggestion is to form a layer of peat which had been previously in a dry state, a *little longer* than the intended midden, six inches thick; and on this to lay fresh dung and peat in alternate courses, diminishing each layer of dung from ten inches in thickness until the compost is three or four feet high, when it should be covered from the ends (which should be formed to overlap for the purpose) and the sides with peat. His lordship's proportion is, one load of dung to three of peat, in mild or warm, and a little more dung in cold weather, so as to produce a full and general fermentation, which in summer will be so rapid and violent as to require an additional application of peat. The heap should be turned upside down and thoroughly mixed, and all the lumps broken a few weeks before using, after which it ferments moderately a second time, and then presents the appearance of garden-mould, and equals farm-yard manure in strength.*

In some parts of the north-east coast of Scotland, the refuse of fish, particularly that of whale† blubber, is rendered a source of fertilization. Even the entrails of herrings are applied to the soil. Farmers in the vicinity of Peterhead have manured 500 acres within a season. The refuse of one boat, with the dog-fish, being sufficient, on an average, for two acres.‡

There are various substances besides the dung of domesticated animals, such as soaper's waste, the offal of the shambles, the refuse of various manufactures in which the skins and wool of animals are used, which rank among the animal and vegetable manures, and tend to enrich the dunghill; but it is unnecessary to particularize their individual properties as they contribute in so small a proportion to the mass of fertilizing matter.

Mere theoretical farmers have, in some instances, supplied manure of the vegetable kind alone, by the ploughing down of some tares, pease, and other leguminous crops. In some of the northern countries, buck wheat is used for this purpose; but though this practiee may in some climates be beneficial, especially where vegetation is rapid and luxuriant, it should be deprecated by us as bad husbandry; for it is but a wretched economy thus to apply green food, which, *if* taken to cattle-sheds, would be rendered first a valuable source of animal subsistence, and *afterwards* a nutritious food for the sustenance of vegetable life.

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* For full details, see British Husbandry.

† From the increasing demand for bones, as a material of manure, it is recommended that the whale-fishers should bring home the bones of the whales after flinching the blubber, instead of consigning them as hitherto to the deep.

‡ The importance attached by the peasantry of that part of Great Britain, may be exemplified by an anecdote recorded of a poor woman, employed at Peterhead in gutting herrings. She had been labouring in her vocation, and had a large basketful of the entrails, which by some accident fell into deep water, along with herself. With difficulty she was saved from drowning; yet was silly enough to manifest great grief for the loss of her basket and its precious contents. "Be thankfu', Moggy Bell, that you're a living woman," said the fisherman who had rescued her from drowning. "A living woman," quoth she; "how can you say so, when I have lost a' my guts?"

Instead of postponing, as is so universal in Ireland, the ploughing of stubble land until Christmas, and thus allowing the stubbles to become utterly sapless and unprofitable, it will be found good economy to employ women and boys in pulling them for the farm-yard. When they are cut high by the sickle, the quantity of material which they afford when taken up and collected is very considerable, and amply repays the cost. The small holder should always employ his family in this task, or if the field is to be broken up for another crop, he may, as is often done in England, use a breast-plough, and pare off weeds and stubble together, and rake them into heaps. This serves to clear the land while it adds to the dung-heap. A horse-paring plough, succeeded by the harrow or couch-rake, can also be most advantageously employed in the same kind of labour.

To render this almost exploded practice as beneficial as possible to the soil, the plants should be turned in before they have either exhausted their own luxuriance, or the substance of the land by maturing or even forming seed.

Mineral Manures.—"These may act upon the soil: 1st, by improving its texture, or by rendering the parts of it which are insoluble, fertile, or by otherwise fitting it to promote the growth of plants.

"2nd. They may act immediately upon the plant itself by being received into its substance."*

Though we cannot generally distinguish these different modes of action upon different vegetables, we know that they promote, by some physical process, the growth of those vegetables; and we apply these minerals, which are in effect manures, according to the results which experience proves they will produce on the required productions. Lime is the principal of these substances, (*see lime,*) the mode of using which we have now to consider in this place.

This may be very briefly stated. It should be slaked with water when deposited in a heap on the field where it is required, and evenly spread from a cart with a short-handled shovel over the surface in a dry, powdered state; for if allowed to remain in small loads for the natural dampness of the weather to slake it, there is great probability of its being clotted like mortar, and consequently unfit for even spreading. It is true that on warm soils, quick lime, (or *hydrate*, as it is termed, when it has just absorbed water, and not yet imbibed the carbonic acid, which renders it innoxious,) especially in large quantities, is often injurious in its effects from its caustic property; but on the other hand, if lime be necessary at all, it should be applied in the most economical way; and though hydrate of lime in excess be injurious, while carbonate of lime (that which has lost its acid or caustic qualities) may be used to any extent without danger. The application of a small quantity of the former, (quick-lime,) while it serves the purposes of the farmer in stimulating the capabilities of his land, does not utterly annihilate the vegetable matter contained in it. In short, where lime is at all beneficial, quick-lime (in a smaller proportion than if in the carbonic state) will be the most so; the error lies in the excess of the dose; for if the vegetable matter shall have been already totally consumed on any soil (especially of a calcareous nature) from over-cropping, lime in any state is unsuitable.

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* Low's Elements.

The food of plants (though this is a mysterious subject) is best applied to them in this case through the medium of *putrescent manures*, which unquestionably supply its elements.

When acids abound in earth—as in peat—quick-lime (and in this case *magnesian*-lime is most applicable) answers the twofold purpose of neutralizing the acid (gallic,) which it effects by forming new chemical combinations, and of decomposing the mass of inert vegetable matter in peat, and so rendering it a freely vegetating substance; and therefore its chief efficacy in producing the necessary effect is lost by allowing it to attain the *carbonate* state. What, under contrary circumstances, would be poisonous, is here a medicine of the most sanative nature. Lime in *any* state, applied to the surface of peat soil, (and in such case it should be given in large quantities,) causes the vegetation of white clover and the finer grasses, where only the coarsest herbage had previously appeared; but as a general rule, lime, especially where it is a costly article, is most efficaciously applied to fallows, and should be harrowed or *lightly* ploughed in at the conclusion of the course of tillage, as it has a tendency to sink in the soil; and it is almost useless to supply it to any land requiring drainage. It is obviously more equally blended with the soil by being harrowed into it when previously pulverized during the process of fallowing, and more searching in its operations, than if scattered over a grass field, where it often lies for a long time in clotted lumps, and with no more operative power than powdered and uncalcined limestone. When judiciously scattered on the surface, however, it is better to let it act on the ley for two or three years before breaking it up. It produces good effect after one year, but much more after two or three.

The use of lime mixed with composts of vegetable matter, weeds, the scourings of ditches, old ley sods, and *old banks of earth*, on which it acts with great energy, (rendering a source of fertility that which had been totally inert,) either as top-dressing for grass-lands, or as manure for potatoes, is most important; by a prudent application of it, in this way, the putrescent manures can be principally applied to turnip-culture, and to beans, for which latter crop calcareous manure is unsuitable, and by no manuring are such abundant crops of potatoes raised, as through the means of such composts, or of unmixed lime, ploughed (all through) into the fallow, if a small portion of farm-yard dung be afterwards added to the potato sets in the drills, (see *Potatoes;*) and the same treatment as to lime, but without limiting the dung-compost so much as for potatoes, is most efficacious for turnips. We recommend a compost of lime and earth, where putrescent manures are scarce, which has been found very useful in the county of Cork.

"Let a platform of any kind of mould or earth, the richer the better, be formed, about six inches thick, twelve feet wide, and as long as may be necessary for the extent of land to be manured. At one end of this let the first load of lime fresh from the kiln be placed four inches thick. Let the lime be then not only slacked but *moistened* with a solution of rock-salt, or any common salt, in water, at the rate of 6lbs. of salt to each barrel of lime, pouring the solution or pickle gradually and evenly on the lime, as the latter is found to imbibe it. Then spread the lime thus moistened two or three inches thick on the platform, and cover it with four or five inches of mould. Let the second load of lime be placed on the platform near the first, and treated in the same manner. When the entire platform is thus covered, begin again with a second layer of lime; slake, moisten, spread and cover it, as the first, until it be also finished, and proceed in the same manner with a third and fourth layer. If the mould be not collected in one place, but deposited in a long row, as when the earth of a headland is used, one or two layers of lime and earth will be more convenient, and will be equally advantageous. When the whole is covered with earth, let the heap be cut down and well mixed, in which state it may be suffered to lie until a short time before it is used, when it should be again turned. The proportion of water in which the salt is dissolved depends on the state of the earth or mould. If the latter be wet, twenty gallons of water impregnated with 6lbs. of salt, is sufficient for each barrel of lime; if it be dry, half a hogshead of water to that quantity of salt and lime, will be necessary. Forty barrels of lime treated in this manner is a full dressing for an acre of potatoes; half the quantity is enough as a top-dressing for an acre of grass-land."

The English Agricultural Society have circulated queries among the farmers regarding the application of lime as a manure; "the object being (as is stated in the journal of that society) to obtain the results of experience, under the many variations of soil, climate, culture, and other circumstances which this country affords."

If quick lime be applied for potatoes or turnips, a sufficient interval of time should elapse, until it loses its caustic nature, else it would essentially injure the effects and qualities of the dung.

The allowance of lime administered to fallows varies considerably, according to the cost at which it can be procured, the nature of the soil, and the purpose to which the fallow is to be devoted; a strong clay soil requires more than a light one, and the naked fallow, which is to have no other manure—as in the very general preparation for wheat, into the actual composition of which grain it enters—obviously requires a much larger quantity than when fallow crops are to be taken with any portion of putrescent manure. Where lime is abundant, 400 bushels is a common allowance on a fallow for wheat; on light soil, where it has a lesser body to act upon, a much smaller quantity suffices; all *fresh* land is powerfully affected by lime, from the abundance of vegetable substance upon which it acts; and, exactly in proportion to the deficiency of this, will it diminish in efficiency; from the same principle, a repetition of the application of lime, after a lapse of two or three years—supposing an ample proportion to have been given in the first instance—will not be attended with the same results as before, unless there had been introduced into the soil, through the instrumentality of green crops, a fresh supply of vegetable matter. The effects of lime on land, are said to continue for six or seven years; and, in the ordinary course of husbandry, a good liming is not given more frequently, though it would be better to give smaller quantities, and to repeat the application, provided that the green crop system proceeds, once in a four-course rotation. The benefits resulting from the use of lime are incalculably great, and proved beyond all dispute on the same farms, on which, in several instances, the richer parts unlimed have produced uniformly less than the poorer that had been manured with lime, under the same course of management, and during a long series of years. On the whole, the observations of Sir John Sinclair seem critically correct, "that unless where a soil has by nature enough of calcareous matter in its composition for the purpose of vegetation, it can neither be brought into its most fertile state, nor will other manures be so useful as they ought, if lime, or some other calcareous earth be not previously applied."*

Limestone gravel acts mechanically, as well as in the way of both a stimulant and solvent; and is especially efficacious on mosses or bogs; it may be applied in almost unlimited quantity on such soil; a covering of two or three inches at least will be necessary to alter and compress the texture of the coarse herbage with which bogs abound, and to consolidate the spongy soil. It is obvious that in dry summer weather only, or in very hard frost, can this material be carted on the ground. (See *Limestone Gravel.*)

Gypsum, alabaster, or plaster of Paris, as it is also called from being found in quarries near Paris, is another of the calcareous manures. This substance is *sulphate* of lime; but besides sulphuric acid, it contains twenty-one per cent. of water. It can be reduced like limestone to a state of powder by fire, or dissolved by water; but as the calcination seems to produce no alteration in its nature as a manure, the expense of that operation may better be dispensed with. For its dissolution by water, 450 or 500 times its own weight of water is required—such is its insolubility. This property of absorbing water has given rise to an opinion sometimes entertained, that it may be useful to the soil from its power of attracting moisture; but from the insignificance of the quantities in which it is applied, this notion has no foundation in fact. There are several quarries of it in England, and some of it has been found on the estate of Mr. Shirley, in the county of Monaghan; but in Scotland it is as rarely found as in Ireland. It was introduced into Pennsylvania by Benjamin Franklin, who had heard of its great utility to agriculture in Germany and Switzerland. Yet, on the whole, though in certain cases its application has produced very beneficial results, it is now of little estimation as a manure. In many parts of England, where it has been tried in every variety of experiment, it has signally failed; but on the other hand, some crops of sainfoin layers at Holkham, in Norfolk, have been doubled by it, as is testified by Mr. Blaikie, the bailiff of Mr. Coke. Gypsum is found in the ashes of clover, rye-grass, lucerne, sainfoin, &c.; and is therefore supposed by Sir Humphry Davy to be necessary to the composition of their woody fibre; and for grasses only does it appear to have any affinity; but for the consumption of these productions there is on well cultivated land a supply of it, either in the manures which are supplied to them (for it exists in stable-dung and all the manures of grass-fed animals) from the farm-yard, or from the droppings of cattle at pasture. "It is possible (as the professor observes) that lands which have ceased to bear good crops of clover and other artificial grasses may be restored by being manured with gypsum;" and his conjecture is confirmed by the admitted fact of its having renovated the crops of artificial grasses on chalky and other light or dry soils, and at a very trifling expense, as appears from various communications to the Board of Agriculture—from three to five bushels, at two shillings per bushel, being a sufficient supply for an acre; and though calcareous in its nature, gypsum is as useful on limestone as on any other dry soil. It is, however, like lime, perfectly inert on land deficient in vegetable matter, and should be confined in its use to grasses and the leguminous plants. It never appears to produce better effects than when laid on red clover, when so far advanced that the leaves nearly cover the surface; and it appears to act with the best effect when it adheres to them for a considerable time. As a top-dressing it should be applied in the latter end of April, or the beginning of May; and spread at the rate of five or six bushels to the acre, by hand, or through a sieve, when the leaves are so moist that it will adhere to them. The American farmers lay it upon fresh land; but it is doubted whether gypsum improves the soil, unless through the means of its powers upon the peculiar crops to which it is appropriated; and even upon these, its effects, it is asserted, will be comparatively trifling if it be *ploughed* in.

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* Code of Husbandry.

Sea-sand, on some parts of our coasts, is so highly calcareous as to be almost equal in its fertilizing effects to limestone, if administered in sufficient quantities; and sea-shells, which abound on many of our shores are said to be superior to the usual sorts of limestone. According to Sir John Sinclair, uncalcined shells have not, however, the same influence on the soil which they exercise when burnt. This, however, would, we apprehend, be a very unprofitable operation, as they could not be collected in such quantities as to render the process of burning them in a kiln remunerative: it is better to pound them into dust, as is often done with oyster-shells. Sea-shells are so mixed, ordinarily, with sand, as to become, for all practical purposes, inseparable. When sea-sand (as on the Clonakilty strand, in the county of Cork) is composed almost altogether of calcareous matter, it is so valuable as manure, that the natives take it at least ten miles into the interior, and scatter it actually from the hand, at the rate of 20 loads of 10 cwt. to the acre; but it is not drawn in such heavy loads to the highland districts there, as may be supposed; mules transport it on their backs to the mountains, as they do also in the county of Kerry, at the rate of 2 cwt. per load. Yet severe, and apparently expensive, as such labour must be, it is repaid by the effects of this calcareous sand. In the neighbourhood of the sea, it is of course used more profusely, at the rate of 800 loads, of 10 cwt., to the acre, and the beneficial results are proportional. On the coast of Galway, also, there is a coraline sand, in inexhaustible quantities, which is used in the same way, at the rate of from 20 to 30 tons per acre,* at the expense of from £3 to £5. The value of sea-sand, when mixed with shells, is also appreciated on all the portions of our coasts, where it is found; for example, besides those places already named in Ireland, it is applied, with much success, in the North and East Ridings of Yorkshire, in Devonshire and Cornwall, in Caithness and Aberdeenshire.

Even where it contains little or no calcareous matter, sea-sand, especially when previously saturated with salt-water, is highly useful; and its mechanical effects on cold, stiff, tenacious soils, which it tends to loosen, and to reduce to a state more friable and manageable, are important: every where it is useful for mixing with composts of earth, and as a substratum for absorbing the overflowings of the farm-yard, or for bedding cattle in summer, or as a fit material for imbibing the juices of sea-weed, (see *Sea-ware.*)

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* See Statistical Survey of the County of Galway, by Hely Dutton, Esq.

Marl, though last not least in value and efficacy, completes the list of the mineral manures which are of importance. See *Marl.* See *Salt.*

3. *Mixed Manures.*—This class of manures, according to Low's definition, consists of those derived partly from organic, and partly from mineral substances. *Ashes of coal or wood* rank among the mixed or miscellaneous manures, the former, though properly mineral, are generally mixed more or less with vegetable and animal substances in the ash-pit. They produce good crops of turnips, even without fertilizing accompaniments, on fresh land in good condition. Coal ashes are the most worthless of all substances as manures, but since they can be rendered the means of raising a crop that produces manure, they are not useless. The finer they are, the better. The turnip crop produced by them should be consumed by sheep on the ground, or lime should be applied to the land, on the removal of the turnips, if a wheat crop is to be expected in the next succession, for, though coal ashes or cinders will, from peculiar properties, aid the growth of turnips, they will not add pabulum to the soil, for the nourishment of a succeeding and scourging crop.

But *peat* ashes are of vast importance to the occupiers of bog land, as they supply on the *spot* one of the best manures for turnips, and that peat which yields red ashes is the best, the other partaking too much of clay; the red colour is occasioned by oxide of iron, which is ascertained to be of no injury to the soil. In Holland, as on the mosses of Scotland, and the bogs of Ireland, peat ashes are in great repute; they are imported from Holland into Great Britain, where they sell for £3 per ton, which contains 56 bushels—a sufficient allowance for top-dressing three acres of clover, (it is applied to the second crop,) which it fertilizes powerfully. Sir John Sinclair, in his tour to Flanders, has pointed out the great value and use of this manure, and a recent writer* has communicated to the Highland Society of Scotland, some facts which corroborate the statement of the distinguished baronet.

By an analysis made by Professor Brands of the Royal Institution, the contents of the specimen given to him were—

Silicious earth - - -	32
Sulphate of lime - - -	12
Sulphate and muriate of soda - -	6
Carbonate of lime - - -	40
Oxide of iron - - -	3
Impurities and loss - - -	7
	100

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* Mr. Mitchell, Quarterly Journal of Agriculture.

It appears from the important communication of Mr. Mitchell, that carbonate of lime forms a considerable part of the Dutch ashes; and to this, no doubt, their great excellence is mainly attributable. The Norbury peat so celebrated as a manure in Berkshire, resembles the peat of Holland in this particular, as the ashes produced from it contain a good deal of lime, which is deposited in the plain where the peat is obtained by the rains which wash it downwards from the chalky hills on each side.* But the Scotch and Irish peat is almost universally a compound of coarse aquatic plants, and other matter decomposed by stagnant water, and without the calcareous substance which renders the Dutch ashes so fertilizing. All ashes may be considered efficacious in proportion to the nutritious quality of the matter whence they are derived; they should be applied to land only when in a dry condition.

Burnt Clay, by which is understood the *subsoil* alone, without any of the surface vegetable matter, has been strongly recommended by many practical writers on husbandry as a good manure; and for several successive years was used by the late Major-General Beatson in particular, on his strong clay land in Sussex; that gentleman applied his farm-yard dung to hops and a small portion of potatoes; and has stated that his wheat crops were more productive by thirty-three per cent. than those of his neighbours; such was his prejudice in its favour, that he gave it a preference over lime or farm-yard manure; his practice was, to burn all the subsoil of his headriggs. Even this in many instances might be a very wasteful process; and if the practice were carried so far as to require clay from the interior parts of a farm, some notion of the area for excavation required on a large farm, may be formed from the calculation for a single acre; it requires 150 square yards of surface,† six inches deep, for a single acre; or a pit of proportionate size of subsoil.‡

Mr. Burroughs, in his Essays on Green Crops, adduces several facts in proof of the efficacy of burnt clay; and in one of his last essays, after some experience on the subject, he concludes with the observation, "that it may be well considered *an inexhaustible source of valuable manure*." But let him speak for himself—

> "Burned earth may be depended on as a manure fit to produce abundant turnip crops of every description, on a variety of soils; even the Swedes, so difficult to grow on light soils, will prove a more luxuriant crop with this manure than with *farm-yard* dung, and are less liable to be cut off by the fly. For those crops, however, it should be well prepared by breaking down the kilns, as they are sufficiently

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* See British Husbandry.

† This, of course, supplies the most valuable ashes.

‡ British Husbandry.

burned, and by pulverising the sods and mixing the ashes through them, and this should be repeated a third or fourth time if necessary.

"It may be supposed by some, that any crops sown on this manure would be precarious in a dry season, not containing, as they may conceive, any enriching qualities or properties to preserve moisture. But this is by no means the case, for it will be found, that an application of torrefied earth makes the land on which it is applied more capable of absorbing moisture from the atmosphere, and by minutely dividing the soil, the roots of plants can search more freely for nourishment. I have often observed that farm-yard dung, unless very well prepared, does not, in excessively dry seasons, supply sufficient moisture to the roots of plants; and that, during such seasons, crops sown on ashes or burned earth have uniformly thriven, while those in dunged land have gradually declined. I state this to show more clearly the wonderful property of all burned and torrefied substances, in absorbing the food of plants from the atmosphere, and afterwards preserving these for the benefit of their vegetation."*

The late Mr. Curwen, M. P. who made experiments with burnt clay on a vast scale, (having raised fifty acres of Swedish turnips in one year, with the allowance of about fifty single horse carts to the statute acre,) in a letter which was published in the Edinburgh Farmer's Magazine, Sept. 1815, corroborates the opinion of Mr. Burroughs, as to the chemical cause which renders the use of ashes so effectual:

"The advantage derived from ashes appears to be by *absorption of the atmosphere.*† *The necessity of having them fine* (admitting the principle correct) is indispensable.

"I have recently seen a good deal of burning in various parts of Scotland, most of which was ill done, being burnt into lumps. I question whether clay can be made into ashes advantageously without a mixture of surface soil. It is either calcined, or not sufficiently burnt.

"There are twelve mounds with seventy-two Winchester bushels each. One fire would have burnt the whole. This was not deemed expedient, as the increased cost of cartage would far have exceeded the expense of the additional lime.

"I think it may fairly be supposed that the lime adds full its worth to the quality of the ashes. Where limestone can be had, I should advise the burning a small quantity in the mounds, which would be a great improvement to the ashes, and at the same time help to keep the fire in."‡

In another communication the same spirited cultivator observes, that on his farm (the Schoose) of 600 acres, he could not raise the quantity of turnips necessary for his heavy stock, consisting of 126 head and 500 sheep without these ashes. To another farm (light and hungry) he removed all the farm-yard dung produced by his turnips on the Schoose farm, to which he supplied *lime* instead, the only auxiliary to the burnt clay.

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* Burroughs's Essays on Agriculture.

† To the absorption of azote more particularly.

‡ See Clay-kiln.

With such strong testimony in favour of burnt clay, it would be presumptuous to deny its efficacy, and injudicious in the extreme to discourage those who have no other sources of manure; but we think with many others, that its value has been too highly estimated. It will, no doubt, tend to prevent the cohesion of the particles of clay, and so far *conduce* to fertility; but for this latter purpose, any fine gravel or sand might produce the same effect. Under any circumstances it must be very transient in its effect as a manuring principle if it contains any such quality, and on *light* lands it can have little if any good effects.

Soot is a powerful stimulant, but not of such general abundance and application as to require lengthened comment.

It is, however, coming into repute; and Mr. A. Main, factor to the Earl of Dalhousie, who has long used it extensively, has contrived a machine for the even and economical distribution of it. He has promised the public to communicate the results of his experiments as to the *quantities* in which it should be used.

Road-Scrapings and Street Dung are obviously mixed substances. The importance of the former to farmers living near towns, and able to bring return loads, is fully appreciated. The variety of rich matter of which it is composed, render it well worth cartage or water conveyance when the facilities are available.

MARL is a mixture of lime and clay, and of four qualities, according as clay, sand, stone, or shells predominate; but for practical purposes the two-fold classification of *earth* and *shell* marl is sufficient.*

The sub-varieties of quality under the principal heads are very great; the proportion of carbonate of lime being very different in combination with the other substances.

Shell Marl is incomparably the most valuable, as this is chiefly composed of the shells of fresh or salt water fish partially decomposed, with the animal matter of their once living tenants, and of innumerable aquatic beings transmuted by the influence of time into the richest mould. This highly calcareous marl, which is found at the bottom of bogs and lakes, and where stagnant water has long rested before it was drained off, is of a very unctuous nature, when first disinterred, but becomes a gritty powder when exposed to the sun or drying air. A very small quantity of this (from 20 to 30 cart-loads) is sufficient for the manuring of an acre. It is used with wonderful effect on fallow-land for wheat; and is the only kind which ought to be applied to broken land.

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* See British Husbandry.

Earth Marl is also very greasy when wet, though it loses its adhesive properties after lengthened exposure to the air. Unless this contains a fair portion of carbonate of lime, it is hardly worth the expense of raising and carting to any considerable distance. When it is good in its kind, it is much and justly prized, for silicious, peaty, or any light soils, as these are deficient in solidity and cohesiveness; for the remedy of these deficiencies marl is far more efficacious than lime alone; for while, like lime, it acts as a solvent and stimulant, (though with very inferior power,) it adds to the staple of the soil, and *permanently* improves its texture. Marl is often deposited under a heavy covering of clay, and immediately over a layer of rock limestone, or rotten limestone earth (almost black in colour) with small fragments of the rock interspersed, which is highly valuable. The effects of this upon land are said to be very durable; and as it is friable even when first taken up, it may be applied to land in the fallow state as well as in that of pasturage.

Marl is raised from marl-pits, somewhat like chalk, but with much less security to the workmen, whose method is to undermine a large mass of it with pickaxes, loosening it from the top and sides with crow-bars, occasionally drawing ruin on their own heads by inattention and foolhardiness. When excavated areas are no longer required for the purpose of yielding marl, they ought to be levelled (as far as localities will allow) and planted with trees, or turned to some useful purpose; if left for ponds, the margin should be planted with osiers and willows, in which case, instead of appearing as unsightly and dangerous hollows, they may be rendered pleasing in appearance.

The expense of giving a *claying* to land cannot be stated with any kind of precision, as this depends altogether on the distance of the marl-pit from the ground to be manured, the number of loads per acre, (varying from 400 to 600 or 800,) and the *groundage* to be paid. We have known the cost to be as high as £10 per acre, and as low as £3 per acre. Common sense points out the expediency (when circumstances present a choice) of raising marl on the more elevated quarters of a farm, as the upward draught of so ponderous a substance must seriously increase the cost of carting it out. Summer is the proper time for raising and carting it; and it should be laid exclusively on grass-land, on which it causes a degree of fermentation and decomposition which contributes greatly to the improvement of the pasturage for black cattle* or horses; and on this it should lie at least for one summer and winter (judicious farmers leave it for two years) before the ley is ploughed up for oats, which is the best crop with which to break the land.

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* It is unfit for sheep, unless they are fattening off for the butcher.

Marl, from its tendency to sink in the land, should be kept as much as possible on the surface. After two years it will be found to have penetrated very considerably into the sward. No one who understands the nature of *earth-marl* will apply it to land in a fallow state, though *shell* marl, may, perhaps, be easily incorporated with the broken soil in the course of fallowing, if laid on at an early period of the summer. The beneficial effects of marl are perceptible for at least ten years; and, except on hungry silicious soils, it is unusual to repeat the application (if used in large quantities in the first instance) within that interval.

As uniformity of spreading and minute division of this manure are desirable, it should be harrowed on the surface as soon as it begins to crumble, and then equally diffused; if it be too *rocky** for pulverization by the harrow, it should be first broken by heavy rollers or strong hand-mallets.

When putrescent manure is afforded to crops of potatoes or turnips succeeding corn, the produce for the first years is remarkably great. Indeed the extremely fertilizing powers of marl are not fully developed until farm-yard dung becomes incorporated with it. No other manure will cause the ground to yield so many successive scourging crops of wheat or other grain, if exhaustion of the productive powers of the soil be desirable. The comparative excellence of marls can only be ascertained by analysis—the quantity of carbonate of lime being the measure of its value. As a test for ascertaining the presence of lime in any supposed marl, the following rule is satisfactory and simple:—

> "Let the marl be put into a glass partly filled with water, which will expel a portion of acid contained mechanically in the marl, and thus obviate one source of fallacy. When the marl is thoroughly penetrated by the water, add a little muriatic acid or spirit of salt. If a discharge of air should ensue, the marly nature of the earth will be sufficiently established."†

MEADOW—Grass-land mown for hay. Low alluvial land, or that which can be irrigated at pleasure, is usually left for the scythe, either from its productiveness from the rich deposits which are periodically laid on it, or from its being too wet for cattle to graze on it in winter without poaching the surface.

In a proper rotation system, upland is also occasionally devoted to the production of grass for the scythe.

The quality of hay on undrained meadows will be always coarse; it is essential therefore to have them free from superfluous moisture by drains of some sort. Where open dykes intersect, care should be taken to scour them in summer, and to mix lime with the vegetable and earthy substances dug out. The compost can be either spread upon the surface in the ensuing spring, or immediately after mowing in the following year. Top-dressing is best applied after mowing, when the roots of the grass-plants are bare, and, therefore, in the best condition to receive a covering of fertile matter, which also is serviceable in protecting and nourishing the grass-seeds which have fallen in the hay-making season; but the proper season for applying *liquid* manure is in dry, *spring* weather.

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* One of the four classes is termed rock-marl.

† Harvy's Elements of Experimental Chemistry.

In upland situations, meadows are either alternately mown and pastured, (see *Pastures,*) or broken up for oats or wheat, after they have yielded a crop of hay, and been grazed during the preceding year.

The practice of leaving young leys in pasture one year after the first mowing, and then ploughing them up, is very general in England, and Ireland. The late Mr. Rennie, of Phantassie, however, broke up his leys the year after mowing, unless they were top-dressed.

Grass-land kept constantly for meadow ought never to be depastured except in dry weather, as the breaking of the surface by the feet of cattle not only injures the grasses of the sward, but, by causing the stagnation of water in holes, causes coarse plants to grow up, and also renders the surface uneven for the scythe.

The rotting of the aftermath is itself a manuring, and in many cases should be undisturbed by cattle. Very highly manured and rank mosses are, however, an exception, for on them the aftergrass, if allowed to decompose, would *scald* the surface in a very injurious way. In the Agricultural Report of Middlesex, it is stated, that—

> "In a piece of clayey meadow-land exposed to the treading of cattle during the wet season of winter, with the view of fully ascertaining the effects of the practice of suffering cattle to remain too long upon grass hay-lands, it was found, that, after three years, notwithstanding every possible care and attention in rolling, manuring, and sowing grass seeds, was employed, it was not restored to its former state of sward."

And on tough yellow clayey land,

> "It is well known, that wherever a bullock makes a hole with his foot it holds water, and totally destroys every vestige of herbage, which is not quite replaced till several years after the hole is grown up."

From the end of February, no beast ought to be allowed to graze on any field designed for hay, though cattle and sheep are often left longer. An *early* and abundant crop is much more likely to be afforded than if stock be permitted to remain until vegetation commences, and the farmer sustains more loss in the end than can be compensated by the additional feeding, if he does not close his meadows early in the spring.

Thistles and docks, &c. should be carefully cut down in meadows; for they are always unsightly, and if they are suffered to flower and seed, they become most troublesome and injurious to the hay. The expense of performing this is a mere trifle, while the advantage is permanent and real. All plants of the rush kind may be easily removed by draining, (of which their presence indicates the necessity,) and by the use of calcareous manures, or *salt*; which, if laid thickly on them, (most efficaciously in spring when they are beginning to shoot and establish themselves,) is fatal to their growth. A top-dressing of sand—even of the worst kind—is excellent for coarse, rushy meadows, as it tends to render the texture of the grasses finer, *but* as the inferiority of the herbage proceeds from wetness, we repeat the necessity of *drains* as the only effectual remedy. Scarifying old meadows is often highly useful, preparatory to laying on manure; cutting the old roots causes them to push out new fibres, and allows the manure to penetrate directly to the roots through the incisions made by the scarifying implement. See *Irrigation*, *Pasture*, and *Hay-making*.

MEADOW FOX-TAIL—A very productive grass on moist or tenacious land.

MOSS—(*Musci*)—A vegetable substance that sometimes spreads over the surface of grass-land.

The intrusion of moss, which is a very troublesome and innutritious weed, is not satisfactorily accounted for, and its extirpation, without tillage, is often exceedingly difficult.

Moss most frequently appears where the sward is not fully occupied by those grasses which have abundant foliage, and where there is a want of consolidation of the surface-soil, either from its natural openness of texture, or the absence of heavy cattle to tread it into a cohesive state.* Instances however, are numerous, of its growth, even where there is a thick sward, and on dry calcareous soil as well as on that which contains much superficial moisture to promote its extension, and to which some writers have erroneously supposed this plant to be limited. Many remedies have been prescribed; a good scarifying, or harrowing, (with short sharp tines,) succeeded by a top-dressing of *salt* or soot is probably the most efficacious; lime in any form is less powerful, though (especially when combined with sand) it remarkably promotes the growth of trefoil tribes, and other grasses, highly palatable to cattle, but does not avail to the exclusion of moss.

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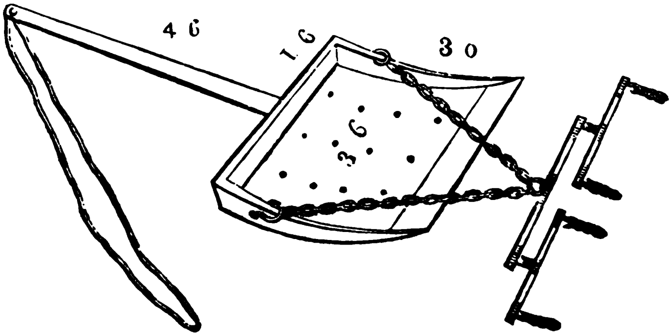
* The absence of moss on the rich grass-lands in the counties of Dublin and Meath, which are almost continually depastured by cattle, tends to the inference that heavy and unceasing pressure is destructive of moss. See *Pasture*.

Mr. Bishop of Perthshire, who has obtained from the Highland Society of Scotland a prize for an essay* "On the Management of Pasture in Regard to the Destruction of Musci," suggests, as the most certain remedy, that a great portion of the summer's grass should remain unconsumed on the ground until the following winter, when the barer it is eaten before the new growth of spring, the finer will be the following summer's grass. Breaking up the land, and sowing appropriate grasses after a course of culture, is a certain remedy, but often a very inconvenient one.

MOSS-LAND.—See *Bog*.

MOULDEBAERT.—This implement of Flemish husbandry resembles a large square malt-shovel; it is strongly prepared with three bars of iron on the lower side, secured by twelve bolts, and is drawn by a pair of horses with swingle trees. The person who drives with long reins, by pressing moderately on the handle as the horses go forward, collects and transports about 5 cwt. of earth to the place where it is be laid down, which is down in the most expeditious manner, by his letting go the handle; this causes the front edge of the implement to dip and catch against the ground, whereby it is at once turned over and emptied of its load. The extremity of the handle, to which a rope is affixed, by this *capsizing* strikes against, and rests upon the swingle-tree bar, and in this manner the mouldebaert is drawn along towards the heap of earth or compost; the driver then, by taking up



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* Quarterly Journal of Agriculture, No. 41.

the rope, draws back the handle, collects his load as before, proceeds to the spot which is to receive it, and the horses are never for a moment delayed.

The dimensions of this implement are as follow:—Breadth across, three feet six inches; length, three feet; height of back, one foot six inches; length of handle, four feet.

MULE.—This is the well-known mongrel offspring of the ass and the mare, or of the she-ass and the horse. In the latter case the produce is called a jennet, and is much less hardy, and therefore rarely bred. The term mule is *generally* applied in the animal creation in the same sense with the hybrid in the vegetable world—signifying the intermixture of two distinct species.

Mules have been known to generate, but, even in warm climates, so rarely as to afford no real exception to the rule of Providence, which forbids their propagation amongst each other, else interminable varieties of defective animals would be the result. The mules of the south of Europe are frequently very fine animals, sixteen or seventeen hands in height, active, handsome, and peculiarly patient of labour, but very inferior in beauty to the horse, particularly about the head and tail. The importation of large Spanish asses into our country has tended greatly to improve our mules, many of which, when bred with care, are sufficiently thick-set and heavy for *all* those purposes in which our largest draught-horses are employed.

The luxurious in riding—like the abbots of old—who delight in easy and secure gestation, have always found the movements of a well-proportioned mule safe and pleasurable. No animal is more surefooted or more hardy; and the diseases to which the mule is liable are few. He attains double the age of the horse, and is much more easily maintained.

In mountainous districts, or wherever cart roads are wanted, the mule is particularly valuable in carrying heavy loads on his back, and evincing great powers of endurance. Mules, compared with horses, are certainly vicious, even to a proverb; but whether by nature or from a bad system of management, is doubtful, although innate stubbornness and treachery are commonly imputed to this animal. In those countries where they are much more generally used, under a hotter sun too than ours, they are tractable in the extreme. We mismanage them while young, when judicious handling might render them good-tempered, and disinclined to the vices and tricks of which we complain.

To have large and handsome mules, the mare should be of a large breed, well-proportioned, with rather small limbs, a moderate-sized head, and a good forehand; and the ass should be of the large Spanish breed.

NETTLE.—There are a great many species of this plant, the presence of which indicates a rich soil, and the application of putrescent manures. The common, small, field nettle is considered by Professor Low to be annual; if so, it, like the other kinds familiar to us, has the power of re-producing itself continually (if undisturbed) either by the seeds or by the roots; and thus becomes practically a perennial. Be this as it may, its sting is extremely sharp; and the fluid which the bag at the bottom of the hollow, perforated tube, that discharges it when its spring is touched, contains, is highly acrimonious. The large nettle, sometimes called the red, dead nettle, which grows three or four feet high under old walls and in rank earth, is also furnished with a bladder at the base, full of burning liquid, which, when insinuated into the punctured hand of the unlucky wight who touches it, causes a blister with considerable itching. There are some kinds which have no sting.

In the west of Ireland the periodically starving peasantry have been frequently found to subsist entirely upon nettles boiled for greens. The better fed labourers in England, and occasionally in Ireland, sometimes use them in spring as substitutes for cabbage; but not without the accompaniment of a little salt-beef or pork. For young turkeys and ducklings, nettles are chopped up with meal or boiled potatoes; and for the human species their roots are found good in poultices for tumours, and also in decoctions for other complaints.

In the north of Europe there are some species (the Siberian or hemp-leaved for instance) so fibrous in the stems as to answer the purposes of hemp for threads and cordage. All *our* nettle varieties, however, are decidedly weeds, but easily extirpated by tillage, and not generally troublesome.*

OATS.—The *wild oat* (*avena fatua*) is an indigenous plant of our country, and but too apt to spring up in poor soil, to the annoyance of the farmer. Yet this native species, worthless as it ever has been, was once cultivated in Dumfrieshire and other districts in Scotland; and it has been said that in the county of Inverness, in a season of remarkably early frost, (1782,) the best samples of oats were those of the wild oat, produced by some coarse, ploughed, but accidentally unsown land. Every one knows that there is more beard than grain in this weed—for such it really is.

No kind of corn is so fit for our general culture as oats, which will grow freely on every description of soil, (though best on that of superior quality,) and with little comparative tilth of the land. They require a moist and rather cold than hot climate. This crop is peculiarly suited to the general circumstances of Irish agriculture; but its treatment, particularly as regards the quality of the grain, is better understood in Scotland than in any other portion of the united kingdom.

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* An excellent kind of catsup can be made of nettles in the following manner:—Take of the leaves of young nettles a wash-hand-bàsin full; let them be sprinkled with salt, in the proportion used for making mushroom catsup, and left to stand for three days; let two quarts of water then be added, and the whole boiled down to one quart; then strain off the liquid, add the spices, (the same exactly, and in the same proportion, as for mushroom catsup;) boil it again, and the composition is made.

Oats are best classed* for distinction sake, under three principal heads — black, dun or grey, and white—though they are sometimes distinguished by only the two characters of early and late. For a cold climate the hardy, early-ripening oats are best; and the late, such as the *potato* and the Poland, on rich, warm, and sheltered soils. The black varieties are least farinaceous; they yield but little meal in proportion to their bulk, and should be sown only where the plump and mealy kinds would not succeed. Of the dun and grey, some are very good, (the least dark-coloured the best,) and those without awns are deemed the most select in quality. The most approved varieties of the third class are also without awns—these yield the greatest weight.

The public are much indebted to Mr. Carroll, a correspondent of the Irish Farmer's Magazine, for some experiments as to the relative produce of fourteen different species, all sown, we believe, on clover ley.

No.	1.	Dun, winter,	sown in October,	produce	24 to 1
„	2.	Hopetown,	sown in April,	do.	28 to 1
„	3.	Black Cumberland	do.	do.	26 to 1
„	4.	True Tartarian black	do.	do.	20 to 1
„	5.	White Cumberland	do.	do.	15 to 1
„	6.	East Lothian	do.	do.	12½ to 1
„	7.	Poland oats	do.	do.	18 to 1
„	8.	Common potato-oats	do.	do.	20 to 1
„	9.	Early Angus oats	do.	do.	18 to 1
„	10.	Late Angus oats	do.	do.	22 to 1
„	11.	Early Kent oats	do.	do.	20 to 1
„	12.	Early Essex oats	do.	do.	21 to 1
„	13.	Common Tartarian, black, *much mixed*,	do.	do.	14 to 1
„	14.	Common black	do.	do.	12½ to 1

"The straw of No. 2, generally from five to seven feet long, neither fell by rains, nor shed by the storms, being exposed *much*, as they all were. The straw of No. 10 very long, fell something. Nos. 5, 6, 7, 9, 11, and 12 rather short, the quality of the land (being pretty good) considered. The straw of No. 3, 3½ to 4 feet long, fell considerably. About Nos. 13 and 14 I observed nothing peculiar, except a deficiency in produce, coarseness of grain, and exceedingly thick skin. No. 8, straw about 4 feet long, stood upright, and free from shedding. No. 4, straw short, and grain not as full as I have had heretofore. Nos. 2 and 3 are the kinds I mean to sow as a *general crop* this spring, and which I mean also to recommend to the tenantry. Of No. 1, I must say I consider it a valuable acquisition to any person having much spring and harvest work to perform, as it can be sown at a comparatively idle time."*

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* See Low.

We are not informed by Mr. Carroll of a very important matter, viz.: the nature of the soil. The early Angus, is, we believe, one of the best kinds on a poor, dry, hungry soil. We should have been pleased to find the white Tartarian (of which the panicles incline to one side) among the number; but, perhaps, the ground was of a cold, wet nature; and as this grain ripens very slowly, it would not have been a suitable kind. As it does not shake and part with its grain like many other sorts, it is one of the best for dry and exposed land, if in very good condition.

The early Cumberland—a longish grain, resembling the early Angus—is a species raised from a single head by a Cumberland farmer, and is earlier than the Hopetown and much earlier than the potato-oat. The latter, though less bulky, is a heavier grain.

From the inferiority (to the eastern coast) of the north-west of England and the bordering parts of Scotland as to climate, and the dampness and coldness of the atmosphere, it is obvious that the grain which succeeds there will be well suited to Ireland. From that portion of Great Britain alone the importation of approved seed into the latter country, where it will find a congenial climate, should take place.

The season for sowing oats varies, according to local circumstances, from the end of February to the beginning of May; but the middle of March may be taken as the average period, and perhaps the best. The most approved method of sowing is on ley, which should be ploughed very early in the year, in order to obtain the mellowing influence of frost, in ridges of breadth according to the nature of the soil. In wet land these should be only nine feet wide; but on dry soil they may extend to twenty-one feet, if the ploughing be so perfect as to obviate the necessity of covering the seed from the furrows by means of the shovel. Let the angles at which the furrow slices are laid be exactly 45 degrees; the seed falling into the troughs will then be covered fully by the sides crumbling down as the harrow passes along. In sandy land, rolling will be useful immediately afterwards; but on clay soil this will be unnecessary at this first stage. In Ireland, the ploughing of ley for oats is unusually defective on the part of the common farmer; he is so prejudiced against this mode, that even if by some fortunate circumstance a superior ploughman should lay the sods for him in the proper way, he will level them completely with the harrow *before* he sows, and then cover the seed with his shovel from the furrow, the earth being previously loosened for the purpose, by the plough or spade; but independently of his partiality to the narrow ridge and furrow system, he rarely *can* plough the ley as it ought to be done; his mould-board is not constructed for laying the sod sufficiently upright; and that is so irregularly placed in consequence, that the harrow alone would not sufficiently cover the seed. His mode, then, is to turn up the ley as flat as possible, in order to spread the seed evenly before covering it with the earth from the furrows. This he lays on in ample quantities; and so far he acts wisely, as heavy covering, especially if the land be light and the season of sowing early, is indispensable to the production of a weighty crop. Those who have not the power of ploughing with precision for the operation of the harrow alone, will act judiciously in adopting the ridge* and furrow method. Besides, where ploughing is indifferent, the other method affords a trenching to the land. On dry soil (except it be rocky) the ridge and furrow culture is chiefly objectionable, as the principal object in such case should be to retain the moisture near the surface; but on mosses or other very wet land it is the safest method. This practice should, however, by no means be generally adopted when the ploughman understands his business, for by laying the furrow slice at the proper angle, and merely using the harrow, there is a great saving of human labour, and of time, which is so precious in the spring months.

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* Irish Farmer's Magazine, No. 64.

Oats are often sown after potatoes or corn crops. In either case the land should be well ridged up, or ploughed and furrowed during the preceding autumn or winter. In spring another ploughing should be given, and the land at the same time formed into ridges of the required breadth; and the seed when sown on the surface in its rough state after ploughing down, should be harrowed perfectly, and rolled across the ridges; or the grain may be ploughed in like barley, and afterwards harrowed. Oats may be sown thick; five bushels to the acre is an average allowance. If harrowed, on well-prepared ley, it comes up in drills; it is almost always sown broad-cast, as the land is rarely pulverized enough for the action of a drill-machine; nor ought the land to be too fine. The grain should be allowed to ripen, but not too *fully*. Some kinds of the black oats, from their tendency to shed the grain from the slightest impulse of wind, require to be cut while the straw is yet green—they will ripen and become hard in stook.

The old system of reaping and binding oats as practised in Scotland and Ireland, is far better than the frequent English practice of raking the corn together in windrows like barley, and putting it together *higgledy piggledy*. In the midland counties of England, where labour may be expensive, and the climate usually dry and steady in harvest, there may be some plausible defence of this mode; but it is quite impracticable in the moist and variable climates of Ireland, and most parts of Scotland. By binding all corn in sheaves, and placing them in stook, there is security against wet weather; the grain and the straw (so valuable for winter fodder) are preserved uninjured in colour and quality; and there is the additional advantage of presenting the grain in a uniform and regular way to the rollers of the threshing mill. When the crop is heavy, it would be madness to risk the danger of fermentation and discoloration, and the shaking of seed on the ground, by the slovenly process of collecting just adverted to.

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* Ridge and furrow tillage was practised even in the time of David. (See Psalm lxv. 10.)

Diseases.—Smut occasionally attacks oats; but rarely in any great degree; and by care, the diseased heads can be removed before the sickle is introduced. Blight, or red-rust, periodically affects and even destroys the crop. This has been observed to occur in warm, moist summers, after mild winters, (always under peculiar atmospheric circumstances.) (See *Blight.*) The red-dust has been ascertained to be the matter of parasitical plants (*fungi*) which, when observed through a miscroscope, have exhibited all the stages of growth and maturity peculiar to their class. The best preventives are, frequent change of seed imported from districts where the disease has not prevailed. The sperm may attach itself to oats stored in a barn, where the sperm of the fungi had been lodged in the straw of a preceding crop. If there be reason to apprehend this, steeping the seed in any mixture sufficiently powerful to destroy the sperm of the fungus without injuring the vitality of the grain, will be found efficacious. It is folly to suppose that these parasitical plants are the effects of mere chance or putrefaction; their configuration is so perfect and uniform in all places where they have been found, that it is certain they contain within themselves the elements of their reproduction, that they are distinct from the plants on which they grow, and will, under favourable circumstances, develope themselves. Seed tainted with the sperm is therefore to be avoided; for although in some seasons the parasites will *not* appear, it is equally certain that they will (and to a ruinous extent too) if the state of the atmosphere and of the soil be favourable to their development.

A disease called segging or sedging, has been sometimes complained of in Scotland. The oats grow and appear to thrive; but afterwards they assume the appearance of sedge, and die away. This has been said to affect the potato-oats in particular. The cause is supposed to be want of draining, as sedging is only observable in clay lands.

Oatmeal porridge, (not stirabout,) "the Prince, of Scotia's food," constitutes the breakfast of the Scotch peasantry during the entire year, and their supper for at least four months, and nearly all their bread—or cakes, as they are called by the natives—is made of oatmeal. Porridge, when properly made of fine oatmeal, is a wholesome and nutritious food. The Scotch themselves, who are enthusiastic admirers of porridge, assert that those whose diet is composed principally of oatmeal and sweet milk, enjoy better health and a more vigorous frame, and are more abundantly cased with *flesh*, than those who deal at the shambles; and some even go so far as to insinuate pretty broadly that porridge is one of the principal causes of the fine spirit of philosophical inquiry, mental research, and prudential conduct which distinguish the Caledonians.

Whether this be so or not, we do not presume to decide, although we may safely conclude that the food which is found to contribute most to the perfect sanity of the body, must lead in no less degree to sharpen and invigorate the intellectual faculties. Yet the affinity alleged to exist between Scottish mind and Scottish porridge seems to be somewhat like that notable discovery of the poor seaman, who said that Tenterden Steeple was the cause of the Goodwin Sands.

The Scotch mode of preparing porridge is simple: put a sufficient quantity of pure water or whey, when it can be obtained, into a pot, and when boiling, sprinkle the meal gently through the fingers of one hand, stirring it round with a small, flat stick, held in the other. Let it boil ten minutes; apply a small quantity of salt; and when about the consistency of cream, empty it into a basin, and when milk-warm, use it with sweet milk. Along the border counties it is lifted out of the pot with a tin ladle into small basins, sufficient for each person. The larger the quantity prepared together the better the flavour.

Cakes made of oatmeal are used by every Scottish family, where oatmeal can be obtained in purity. The process of making them is as follows: put as much meal into a basin as will make one cake, then mix it with cold water by the fingers of the right hand, turning the basin round with the left. When mixed sufficiently, turn it out on a clean board or table, then *knead* it quickly with the knuckles of both hands, adding a little meal occasionally, and using a roller to distend it to the $\frac{1}{8}$ or $\frac{1}{16}$ of an inch in thickness, when you should pare round the edge and divide the mass into three or four parts with a knife, and lay them upon a griddle. When half baked, place them on edge on a *toaster* before the fire until quite dry. Cakes baked by a turf fire have a much finer flavour than those baked upon coals. Sometimes the dough is mixed with a piece of butter, to make the bread more easy of mastication for those whose teeth are not strong.

Meal-seeds are the refuse sifted out of the oatmeal, and are used for making *sowens* (not flummery). The old method of making *sowens* was to infuse the meal-seeds in water, until leavened; then to drain off the milky portion through a hair-sieve, and change the water until the infusion became perfectly sweet. A new method is now adopted instead of this tedious process. It is to pour boiling water upon the seeds, and after steeping them for four hours, press the milky part through a hair-sieve, and pour the infusion into boiling water or whey, then boil it until it attains the consistency of cream, and when cold, it is to be used with sweet milk. Sowens afford a rich repast to those whose palates are not vitiated by luxuries. Sowens are prepared for removal from place to place in this way:—the water is strained off after the solid substance has settled in the bottom, and the white consistence is put into soup-plates or any other shallow vessels, and exposed to the sun, after which it is turned out in cakes exposed to the sun again, spread upon a clean table-cloth, packed up in paper, or pounded into flour, and packed in a bag. When wanted for use, put a small quantity of this fine flour into boiling water, and you will have the finest sowens. This constitutes a nourishing food, and, to weak and delicate stomachs, has all the excellence of arrow-root. Meal-seeds are given to horses instead of oats, and used for fattening pigs when mixed with boiled potatoes and a little salt.

Oatmeal is used in making decoctions for removing recent colds and coughs. It is known in Scotland by the name of *water gruel*, and in Ireland by that *of oatmeal-tea.*

OATMEAL HOW PREPARED.—Oatmeal is made of the various kinds of oats; but those which grow on a light, loamy soil, are the best for oatmeal. In order that it be properly manufactured, the oats should be well cleaned and of equal size, otherwise they will not be clean-shelled without much loss.

KILN-DRYING.—Proper kiln-drying constitutes the first and most essential process in the right manufacture of oatmeal. There is a villanous method of kiln-drying, frequently practised to improve the colour of the corn. This pernicious system of kiln-drying consists in scattering sulphur upon the kiln-fire after the corn has been turned the first time, and immediately after each successive turning this fraudulent process is repeated. Sulphur thus applied improves the colour of oats, and causes fine wheat-flour to have a slight yellow tinge, like genuine Durham mustard; and the consumers suppose that it is made of grain of superior quality. This vile practice tends to cause incurable coughs and consumptions in those who are employed to turn it in the granaries. However small the quantity of sulphur used in this manner, it will act injuriously on the constitution.

The floor of the kiln should be made of cast-iron tiles, pierced with numerous small round holes to admit a free current of air, and placed eighteen feet over the fire, which ought to be placed in a flue four feet in length, with an aperture to admit the air, equalize the heat, and carry off the steam as it arises from the corn, passing through a revolving funnel in the roof, over the centre of the kiln. The corn should be spread equally over the kiln, and turned for the first time when the *sweat* is passing off the upper surface of the oats. It should be turned four times.; and when perfectly free from moisture it should be transferred to a dry, deal floor, and covered over with bags or a sheet until quite cold, when it may be manufactured; but it should neither be put into bags, nor into the mill while it is warm.

The best coal for kiln-drying is the Anthricite, which emits no smoke. Turf is extensively used for this purpose, and answers well; but no kind of fuel gives such an agreeable flavour to oatmeal as the roots of furze.

Steam alone is now used in some kilns for drying corn. These do not differ in any respect from other kilns, except that the beams are hollow on which the tiles rest. The corn is rendered white by this process, and there is a considerable saving of fuel, but the general effects are not yet fully ascertained.

Neither wheat, malt, barley, bere, rye, peas, nor beans, should ever be put upon a cold kiln, but immediately after oats have been removed off the hot kiln. None of those require half the drying of oats, and they should be allowed to lie on the kiln until perfectly cold before being removed.

Shelling the oats is the second process in the manufacture of oatmeal. The best stones for this purpose are the Newcastle freestones. They should be five feet in diameter, free inside the eye, perfectly straight on the face, and make 700 revolutions per minute, being double the speed of grinding stones. To keep them in the best order, they should be dressed with a drove and mallet, then rubbed with a flat stone of the same kind, and pure water, but they should be thoroughly dry before working.

The oats having passed through the shilling stones, pass along the dust-sieve, into the fans, which separate the seeds and small grains from the good quality, which is removed either by elevators or by boy and tackle into the hopper of the grinding-stones.

The third and last process in the manufacture of oatmeal is grinding the shilling or groats. The stones should be five feet in diameter, open inside the eye, straight on the face, but never grooved, like those for grinding wheat, barley, rice, rye, and peas. They should be dressed with a fine cast-steel chisel, and make 300 revolutions per minute. A sieve is suspended under the eye, which completely separates the meal from the seeds.

The best method of preserving oatmeal, is to tread it very hard in a large chest, and to exclude the air. Oatmeal thus prepared will increase in weight in a few months after it is made.

OSIER—(*Salix*)—A species of willow. There are many varieties of the class. The *salix viminalis*, or osier willow, grows but to a moderate height, and has slender, reed-like branches, and long pliant shoots. It is of the aquatic tribe, and grows most freely in moist situations, by the verge of rivers, lakes, and ditches, or on alluvial land, occasionally overflowed, where it is profitably planted for the use which the shoots afford for the purposes of the basket-maker and the cooper. Indeed on any cold, sour, clay soil, otherwise of little value, it will pay the farmer very fairly. Nor need it be confined to moist situations.

Red Huntingdon, or *timber sallow*, is by far the best to plant out for shelter in hedge-rows, or about the cottager's garden, on account of its rapid growth, and the excellent quality of its timber, which combines the qualities of durability and lightness, rendering it fit for many purposes of husbandry. The farmer who has a waste corner without some of the willow tribe is a bad manager, and neither values ornament nor profit. In how many cold and wet situations, now open to every blast, would a plantation of willows, with alders and poplars planted on the ditches, tend materially to evaporate moisture as well as to afford shelter; and while they interlace as a fence, they present at the same time a very pleasing appearance.

The species to be planted should be determined by circumstances, and the uses for which they may be required, whether for hoops or baskets. A view of the following catalogue will afford the necessary information:—Red Huntingdon or timber sallow, for baskets; green ditto, for hoops; white ditto, for hoops or baskets; packthread, ditto, the best for baskets; golden willow, for baskets only. Under any circumstances, the farmer should put down a good proportion of the red Huntingdon or timber sallow for general farm use.

PREPARATION OF THE LAND.—Let the ground be dug fifteen inches deep in the winter, thoroughly broken with the spade, and formed into ridges, with furrows to carry off the water (which in swamps would stagnate) to the depth of two feet, and ten or fifteen feet apart, according to the degree of wetness.

TIME AND MODE OF PLANTING.—In February or March let cuttings fifteen inches long be taken in a direction sloping upwards, from good, well-ripened *two-year-old* wood, and put down at two or two and one-half feet apart every way, leaving *scarcely* one-*third* of the cutting above the ground. Weeds are injurious; and in order to have them kept down, the surface should be hoed for the two first seasons after planting. In order to do this effectually, and with little loss, cabbages may be put down between the rows.

In the fens of England numerous plantations (or holts, as they are provincially termed) are raised, which afford both shelter and ornament. The banks of the river Cam are fringed with them in many parts.

Osiers are cut every year if intended for baskets only; if designed for hoops, they stand for two or three years.

OXEN.—(See *Cattle.*) The use of bullocks for the cart and plough has greatly declined in consequence of the superior profit which they yield if fattened early for the butcher, which can always be effected with improved breeds under modern management. A young ox is of little use for labour, though he may fetch a high price for the shambles. If held over a few years for draught, and kept regularly worked, he loses his aptitude for fattening, requires a long time to recover the effects of hard labour, and while worked, eats at least double the quantity of fodder which would support a horse; and though his food may be less valuable in quality, the loss of quantity more than counterbalances the saving in the other respect. Besides, oxen are ordinarily very slow in their movements; and when celerity of motion is particularly wanted in the field operations during *spring*, this is a serious disadvantage.

It is true that the Devons are tolerably smart and active in their paces; stories are told of some having trotted eight miles an hour;* yet compared with horses they must ever be, from the shortness of their legs, much slower in their paces. By judicious breeding they could, doubtless, be rendered long-legged and active enough for ordinary farm-work; but if so, they would be proportionably unprofitable for the butcher, to whom they must come ultimately, and this before many years pass over their heads, else it would be impossible to have them sufficiently fat and tender for their carnivorous lords. And in hot weather, if not altogether incapacitated for labour, they are at least incapable of the same degree of vigour and exertion which the horse will exhibit under proper treatment.

The subject was admirably discussed more than a quarter of a century ago in the Edinburgh Review, when giving a summary of Sir John Sinclair's most valuable work.

"It is nevertheless certain, that horses are the least expensive, and by far the most convenient labourers, though oxen may be advantageously worked in particular situations. On all farms of a moderate size, cultivated for corn and green crops in regular succession, and where a threshing-mill is not worked by animal power, especially on all farms situated at a distance from markets, fuel, and manure, oxen can seldom or never be employed on a great scale without much loss. An ox team capable of ploughing as much land as a pair of horses, will consume the produce of one-fourth more land, after allowing for the increase of their weight and value. It is to no purpose that calculations are offered to show that oxen can be purchased for less money than horses—that the market value of the food they consume is in some places lower—that they are liable to fewer accidents—and that while the carcase of the ox goes to the shambles, that of the horse is thrown to the dogs or the dunghill. These specious arguments are indeed well calculated to impose on that class whose ignorance of rural affairs is so facetiously described by Burke. But the proper question is, whether, under the most approved courses of modern husbandry, the ox or the horse teams will give the labour required, with the least consumption of produce? Will the produce of an acre of arable land, for instance, return as much labour when consumed by oxen as by horses? The market-price of that produce is merely a local and temporary circumstance, and so is the price of the animals themselves. In the vicinity of large towns, where no distant carriages are required, and which might therefore seem to be well adapted to the employment of oxen, it is acknowledged, that from the great demand for green crops, the price of their food is much higher than that of horses. Besides, it cannot be doubted, that a great demand for working oxen would raise their price —while that of horses would fall in a similar proportion. If a greater number were to meet this demand, other products would necessarily be diminished. The weight of beef gained during the period of labour must indeed be placed to the credit of the oxen; but the beef and labour together require a much greater extent of arable land for their production, than an equal quantity of each obtained separately; the former by fattening oxen at three or four years old, and the latter by the use of horses. We must refer to the works before us, to the General Report in particular, for the further discussion of this much agitated question; and shall only notice, that expense alone is not a sufficient criterion by which to decide it. Great exertions are required at particular seasons, and, in our variable climate, expedition is often a matter of the first importance. Of such exertions oxen are constitutionally incapable; at least none of our present breeds can be compared, in this respect, with horses. Oxen have, accordingly, been laid aside in Scotland, with very few exceptions, in exact proportion to the progress of modern husbandry."

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* An unfortunate ox was once galloped four miles over the Lewes course for 100 guineas, at the rate of fifteen miles an hour.

There is much farm-work which oxen cannot perform; but for ploughing in very heavy, stiff land, or wherever a steady, patient pull is required, as with the subsoil plough, they—or a team of bulls after their season of service in another way—are often more useful than horses.

The system of having some brood-mares, and working them, and their progeny moderately when two-and-a-half years old, and afterwards selling the latter at a good price, seems much more profitable.

Training.—Those intended for work should be first well accustomed to handling, by being tied up at the commencement of winter with trained bullocks in the byres; afterwards, each young one should be connected by means of a halter from a ring in the nose with an iron bow round the neck of the other, who soon teaches his pupil to walk amicably and composedly alongside of him. This yoking, without any draught at first, is a good preparatory training for drawing a weight on the ground, and afterwards the plough, with which the young ox readily learns to step out, *gradually* drawing at the discretion of the trainer, until he is taught to pull his full share.

This is far better than leading bullocks about with a cavesson, and perhaps compelling them to describe a circle round a post with their halters attached to it,—an unnatural and tormenting kind of schooling. Under the quiet tuition of trained oxen, the lively and impatient scholars will have more facility in acquiring their elementary knowledge, and less reluctance to their task, than if, without companionship with their own class of animals, they were under the management of some human blockhead. If they become restive, and plunge, on going out with the older bullocks, these generally give them a stroke with their heads which soon reduces them to proper order, and saves the man-monitor a great deal of trouble. Bullocks when well trained to the plough will readily draw the cart.

PARING AND BURNING—The process of paring off, with a spade or plough, the surface of grass-land, in order to convert it into ashes for the purposes of manure or tillage.

A great deal of discussion has arisen among scientific farmers, as to the utility or disadvantage of the practice. The advocates in its favour assert, that any loss of substance is more than repaid by the improvement in the quality of the land, and its increased productiveness.

"The process of burning renders the soil less compact, less tenacious and retentive of moisture; and when properly applied, may convert a matter that was stiff, damp, and, in consequence, cold, into one powdery, dry, and warm; and much more proper as a bed for vegetable life.

"The great objection made by speculative chemists to paring and burning is, that it destroys vegetable and animal matter, or the manure in the soil; but in cases in which the texture of its earthly ingredients is permanently improved, there is more than a compensation for this temporary disadvantage; and in some soils, where there is an excess of inert vegetable matter, the destruction of it must be beneficial; and the carbonaceous matter remaining in the ashes may be more useful to the crop than the vegetable fibre from which it was produced."*

The alkalies which are produced from the consumed coarse or inert vegetables, powerfully tend to promote the growth of new and more valuable productions. The reduction by fire of such plants as heath, furze, tough, benty grasses, rushes, &c., into the powdery carbonaceous matter to which Sir H. Davy refers, and which from their indestructible properties could not otherwise be reduced without much loss of time and labour to a state of minutely divided particles, which can penetrate at once to the roots of growing plants, is the cheapest and most expeditious mode of treatment.

"From the process radically destroying, in most instances, when well performed, all sorts of plants of the weed kind that may have established themselves in the soils which are subjected to the operation, the lands are left perfectly clean, and therefore in the most proper situation for affording the whole of the nutritious properties which they contain, to the support of the crops that may be grown upon them."

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* Davy's Agricultural Chemistry.

In many parts of England (especially in the fens of Cambridgeshire and Lincolnshire) the practice of paring and burning every seven or eight years still prevails, and even on sandy and chalky downs. Some farmers persist in the practice on the Cotteswold hills in Gloucestershire, on the downs of Oxfordshire, and on the wolds of the East Riding of Yorkshire; it was stated many years ago by Colonel St. Leger, "that if burning wasted the soil, his limestone-land,* only four inches deep, would have been gone long ago, as it had been pared and burnt for ages."

In respect of peaty soils, Mr. Young says, that "whatever variety of sentiments there are on this method for other soils, here there can be none. The universal practice, from the flat fens of Cambridge to the swelling bogs of Ireland, the mountainous moors of the north of England, and the rough sedgy bottoms in almost every part of the kingdom, when they are broken up by men of real practice and observation, is always to pare and burn them."

Penal clauses have been introduced into the leases of most of our land-owners against burning the surface under any pretence; and this prohibition has been rendered perhaps necessary from the *abuse* of the practice, to which we shall yet more particularly refer; but the principal reason assigned for this determination against the method, "that the depth of the soil is diminished by it," is not well founded; for it is not the soil which is burnt, but the grass and its roots. The earth intermixed is not consumed, though calcined; the ashes arise from the vegetable substances; the *staple* of the soil does not decrease, else—

"Whence the known fact, that soils not four inches thick, and which have remained at the same thickness as long as the oldest man can remember, have yet been pared and burnt regularly four or five times in a century? And as the same husbandry is known by record to have been practised for ages in the same land, the staple must have lost three inches every hundred years; in other words it must have been totally gone long ago, and nothing but rock remained; all which is evidently false, the soil at this day being as thick as ever. We may hence conclude what such farmers assert to be true, that the earth suffers no diminution; those roots and bulbs only being reduced to ashes, which in breaking up by the plough alone would not rot away."†

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* Professor Low conjectures that the heat acts beneficially in this case, and on chalky soils, "by dispelling the carbonic acid, and converting the calcareous matter into quicklime, which produces immediate action on vegetation."

† Agricultural Survey of Suffolk.

It has been stated in the annals of agriculture, (what in substance amounts to this,) that on inclosing some waste land in Yorkshire, certain portions were pared and burnt, and that those parts were vastly superior afterwards to those which had not been so treated; it is also recorded that certain allotments on Hounslow Heath succeeded well under the practice, and badly where the turf was ploughed without the application of fire. In the former case the land was at once fit for turnips, potatoes, clover, &c.; in the latter, the tough heath and wiry bent kept the land too light and spongy for any crop.

Heath is of so imperishable a nature that it will exist long under ordinary tillage; and its elasticity is such that it rises after the roller has passed over, and will not consolidate, nor become mould.

> "Paring and burning will pulverize such a soil as much in two years as all other means can effect in twenty. On any sort of soil which has not before been reclaimed from a state of waste, and where furze, broom, brambles, ferns, rushes, &c., abound, these operations when properly performed are productive of the most beneficial consequences. There is, perhaps, no other method that could be so well adapted for preparing land in a state of nature, and encumbered with such productions, for valuable crops with expedition and certainty; and on this account, paring and burning might well be considered by Virgil and other ancient writers as a sure means of improvement."*

The circumstances under which it is disadvantageous to pare and burn are:—

1. Where the surface is of a nature which can be easily reduced to mould by the plough and the harrow, and where there is no excess of *inert* vegetable matter. The gradual decomposition of the vegetable-surface substances will convert them into a more durable and enriching aliment, than if they were reduced to powder by combustion.

2. On poor, silicious soils, "and in all cases in which the texture is already sufficiently loose, or the organizable matter sufficiently soluble."†

Notwithstanding the plausible argument that because rich soils are pre-eminently full of vegetable fibres, (and will of course afford the greatest quantity of ashes,) they should be rendered especially subjected to paring and burning, the practical truth is, that on any rich and naturally friable loams this mode of treatment is not only unnecessary but positively injurious. In the case of peat soil, covered with coarse, and shrubby, and insoluble vegetation, and which has never before been broken up, there is a *necessity* for torrefaction; but in the other cases there is *not*. Sometimes grubs and insects so prevail in old pastures of the best kind, as to render expedient their destruction by fire; but these cases are only few exceptions to a general rule against the combustion of any well organized matter. As Professor Low has well observed—

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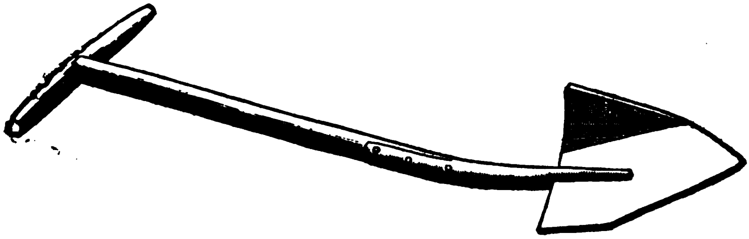
* Complete Farmer.

† Sir H. Davy.

> "When any kind of land is for the *first* time made arable, a good reason may, perhaps, exist for this method of rendering it as soon as possible productive. But after land has been brought into a state of regular culture, it is difficult to believe, notwithstanding the authority of so many farmers in England, that paring and burning are good as a regular system. Great crops are doubtless raised in the fens and other parts where this system prevails; but greater crops still are raised in the north of England and in Scotland, on inferior soils, and with a less favourable climate, where the system of paring and burning is unknown."

There can be no question, however, (whatever difference of opinion there may be regarding this method for other soils,) about the propriety of its adoption on the first breaking up of coarse, peaty soils, particularly in those elevated situations to which the carriage of lime or farm-yard manure would be impracticable. (See *Bogs.*) The method has become objectionable in the judgment of landlords or ignorant agents, from the *too frequent* recurrence of the operation in many instances, the consequent over-cropping, and the non-application of other manures.

Regarding the method of performing the process there are slight differences in the practice of different districts; in some the sod is taken off very lightly from one-and-a-half to two inches in thickness, with a paring horse-plough of different constructions, or with what is called a paring spade or breast-plough form, and is represented in this plate—



The cutting part of this is about nine inches in length, and ten or twelve in breadth, rising up at the right-hand side of the sod next the uncut sward, with frequently a rim. The labourer presses upon the cross-handle with his breast, holding the handle at the same time; he pushes it under the sod horizontally from an inch to an inch and a half deep, and from ten to twelve inches in breadth, for about two feet and a-half in length, and then turns it over.

The Irish labourer, in the bog and mountain districts of his country, works with a kind of mattock, which he calls a *graffane*, and which is a kind of curved adze; and admirably adapted for cutting up the deep roots of brushwood, furze, broom, &c., but not so well calculated for *thin* paring, where there are no such incumbrances, as the breast-plough, or as it is termed in Scotland, the *slaughter*-spade. However, in stony land it is a much better implement, and probably much less injurious to the human frame, than the implement which requires pressure from the breast, that may induce disease in that region. With the *graffane* it is plain, from the description, that the workman reverses the order of his movement from that of him who pushes forward his implement; with the mattock he draws the sod *towards* him. Expert labourers will turn up a great deal of surface in the course of a day with their mattock or *graffane*.

Horse-paring ploughs, which are used wherever the surface is even, and free from stones, and dry, are generally but common swing ploughs, differing principally in the breadth and sharpness of the share. In cutting tough sward, the coulter and share require continual sharpening, and to facilitate the work, there should always be a second set of irons, one in the forge, the other in the plough.

In the fens of England, upon a soil free from obstructions, and which has been previously in a state of cultivation, they use a horse-paring plough of peculiar construction, which executes the work in a very complete manner. It can turn over a furrow from twelve to sixteen inches in breadth and only one inch in thickness.

We ourselves have pared a considerable portion of level bog with a common plough, and cross-cut it with the same implement, moving over the inverted surface, on its side, so that the feathered edge of the share cuts through the sods without disturbing them. This work proceeds very expeditiously, as the transverse incisions need not be closer than three feet. Women and boys follow and raise up the dissevered sods, and gather them, when sufficiently dry, in heaps, and then set fire to them, causing them to burn as much as possible with a smothered fire. The season for paring is from April to June, according to the state of the weather and the land, and after the hurry of ordinary spring work is over.

In average summer weather the sods will be dry enough for burning in a fortnight; and as soon as can be after they have been burnt, and, if possible, before rain falls, the ashes should be spread and lightly ploughed in. Potatoes are, perhaps, the most profitable crop in the first instance; and the best mode of having them dry and well tilled, is to cover the sets laid on narrow ridges, from the furrows, by means of spade and shovel. This in shallow mosses blends some of the clay subsoil with the peat, and keeps them sufficiently secure from any rains that might lodge before the crop could be dug out. Paring and burning is equally a fine preparation for turnips, rape, or any of the cabbage tribe; and according to the season of the year at which the paring and burning has been executed, the description of crop to be sown can be determined. For a second crop of potatoes or turnips, &c. (and without two croppings of these or similar productions the ground will not be in a fit state of preparation for oats or rye) it is advisable to apply a dressing of lime or of dung, which acts most powerfully on the fresh soil.

PARSLEY—is a well-known biennial *garden* plant. It has been recommended for culture in sheep pastures, being, from its antiseptic and diuretic qualities, deemed a good preventive of the rot. Cattle of all kinds seem exceedingly fond of it, but experiments are wanting to establish its value in any respect to the farmer, and from its perishable nature it is certainly useless to sow it on land intended for permanent pasturage.

PARSNEP—A tap-rooted vegetable much more hardy than the carrot, and by many persons cultivated with much success for cattle. Although the soil most appropriate for it, is rich friable loam, through which its roots can penetrate freely, it will grow well on cohesive soil, if previously trenched, or deeply ploughed in the preceding winter; for on the fine pulverization of the earth will its luxuriance depend. In short, the preparation recommended for *carrots*, and precisely the same mode of culture, is necessary for parsneps, which have the advantage of being more hardy, suited to clayey land, and less liable to be destroyed by any kind of insects. All animals eat it greedily when accustomed to it, and fatten on it as on carrots; it is reckoned that thirty perches, where the crop is good, will be sufficient to fatten an ox of three or four years old, when perfectly lean, in the course of three months. It should be given in the proportion of about 30lbs. at a feed, morning, noon, and night; the large ones being split in three or four pieces, and a little hay supplied in the interval of those periods.

In Guernsey and Jersey the milch cows are generally fed upon it with hay in winter, and a fine flavour is imparted to the butter in consequence.

Parsneps are used very much in France for fattening neat cattle and hogs. Steaming or boiling them is strongly to be recommended, especially for swine and poultry. Even the *tops* are useful before the roots are dug or pronged out.

Parsneps are peculiarly suited to the cottager's garden, from their productiveness in almost any kind of soil well prepared, and from their sweet and nutritive properties. The peasantry of Ireland are very fond of them, and yet almost universally neglect to cultivate them.

This root is not to be recommended in preference to the Swedish turnip, for general field culture; for, among other objections, the time of sowing is inconveniently early, and interferes with other farm-labour of great moment, in the commencement of spring, when the seed should be sown, although it *may* be sown in autumn, from the hardy nature of the plant, which is not injured by frost.

The seed of the parsnep, like that of the carrot, cannot be depended upon after a year.

To have good seed, some of the largest and straightest roots, of the Jersey kind, should be selected in a good sheltered aspect, at the distance of two feet from each other. The seed ripens about the end of August, when the heads should be cut off and spread to dry upon a cloth, and then beaten off and put up for use.

PASTURE—Grass-land kept fed down by any animals. Pastures entirely limited to the rearing or fattening of stock are generally called grazing-pastures; and those which are devoted to milch cows or sheep, are termed dairy or sheep-pastures.

There is also the distinction of upland and lowland pastures. The land best adapted to pasturage, is that which has a considerable depth of loam, dry enough to bear the treading of cattle throughout the greater part of the year. Such is most of the grass-land in the neighbourhood of Dublin, which is treated in the following manner:—A heavy stock is admitted (the hedge-row shelter being excellent) throughout the winter, until February, so as to eat the grass very close. In dairy pastures, the milch cows are always housed at night in the severe winter months, but dry stock is left out until the middle of February, when they are taken off the land altogether, and the grass, even where the bottom is cold clay, soon springs up. When the stock are turned on it, fattening horned cattle are generally succeeded at intervals by store-sheep, which are left long enough to eat bare what had been rejected by the others, and thus they improve the herbage; for, though if at unrestricted liberty to select their food, sheep, like other animals, will ramble over the whole range, to pick out the most palatable grasses, they will, when hunger compels, eat even the rank herbage which grows where the dung of their predecessors had fallen, and by their own frequent droppings fertilize more evenly the whole surface for the succeeding stock. Ten sheep per acre are fattened in that district, *besides black cattle*, from the 1st of May to December. The general grasses there are meadow fox-tail and cock's-foot, without other weeds than crows-foot (which usurps a considerable share of the surface) and thistles, which are kept closely cut; but mosses never appear there, from the consolidation of the soil by the constant tread of cattle. Some of these old pastures are occasionally mown in rotation, but merely to supply the fodder for two or three months in spring, and in such case the aftermath is often let, at £1 10s. per acre, to dairymen, to the 1st of November. The grazing from that period to the 1st of February, is estimated as worth 10s. per acre, to the owner for his own stock.

Town manure,* so easily obtained, and perfect *shelter* at all times, materially aid the natural productiveness of the soil. The manure, however, is only applied after mowing, and not then, if there is not to be a repetition of mowing in the ensuing season.

In the county of Meath it is not unusual for the owner of several hundred acres to keep them in perpetual pasture, and yet without degeneracy. The treatment there is to buy cattle in *high* condition at the fair of Ballinasloe in October, to keep them *out* through the winter under *sheltered hedges*, but foddered regularly with hay. The *early bite*, on fields preserved for the purpose, fattens them perfectly for the June markets. A fresh stock, bought in May, succeeds to these, and are sold fat in December. Thus two stocks are fattened and sold off in the year, from the same land, without any aid from green crops, or expense of labour.

No lime, nor manure of any kind, is given to some of the principal grazing pastures in the county of Meath, except what arises from the foddered cattle, and that only to fields exclusively appropriated to meadow. No tillage whatever is permitted,† not even for domestic purposes; oats (the land being too rich for corn) and potatoes are purchased; nor does the grass degenerate, nor is there any moss intermixed with it.

There is no trouble in making money on such pasture-land, and unquestionably the owner acts perhaps *wisely*‡ in pursuing what is to him a very profitable system without those continual risques and losses from various causes, to which tillage farmers are liable, *but*—as regards the community—it is a very injurious system, and we have no doubt that, with a complete farm establishment, and under the eye of an experienced, active, and energetic agriculturist, as much or more profit would be made by a course of alternate husbandry.

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* One horse will draw 20 cwt. at each load, and take two loads to any land not exceeding five miles from the city. Street-manure is purchased at the scavengers' yards at 6d. per ton, and dairy-manure at 2s. 6d. per ton.

† We state what we know to be fact on a farm of fifteen hundred plantation acres of splendid land.

‡ Mr. Lambert, in his Rural Affairs, says that "old pasture land of a *fattening quality* should not be broken up on any account. Will any man be so rash as to destroy a rich surface once established of that nature? The experienced grazier (having an interest in the soil) will resist all inducements to do so."

But, to resume the general subject, coarse, wet, rushy land may be converted into good pasture by draining, and the application of manures; and moory land, particularly, if treated in the same way, and covered with calcareous matter, may be rendered excellent for summer dairy-pasture.

It is hardly necessary to observe, that the description of grasses should be congenial with the nature of the land, (see *Grasses*,) and that some grasses are better for the dairy, for milk, butter, cheese, feeding, or fattening, than others. The mode of management on any pasture should always correspond with the properties of its vegetation. Upland is generally better for sheep, and lowland for neat cattle: and the age of the ley also makes a distinction—that which is newly laid being best for store-cattle, and the old ley for fattening or feeding stock: and the circumstances of *enclosure* and shelter are also material; for example, though a very extensive unenclosed range answers well for sheep in summer, it will not be suitable in the severity of winter, nor will open land at any time be so productive for milch cows, or fattening cattle, which should be frequently shifted to fresh supplies of grass, while the herbage which to their *fastidious* tastes is unpalatable will be readily eaten by a stock of store-cattle previously unaccustomed to luxurious fare. It is indeed one of the most important points in grazing, to feed down pasture-lands judiciously, by successive and different *kinds* of stock, and thus improve the *quality* of the herbage, though it may not add to its *fertility*. The close biting of sheep, on what had been rank from preceding cattle, tends more than any other treatment to render the herbage *fine* and delicate in its texture. Top-dressing with calcareous matter, or folding sheep on turnips thrown on the turf, will also tend to the same result. *Coarse* grasses are more than any other improved by close feeding. It becomes then a matter of doubt whether it is prudent to permit grass to grow so rankly before the stock is turned upon it, as to give them a choice in the selection of their favorite blades, for with this liberty they will, of course, reject altogether what they would otherwise eat.

It is well known that certain grasses are preferred by particular species of stock, and some persons on this account put different kinds of animals at the same time on their pasture, but it is difficult to proportion the different numbers, especially as they will all agree in cropping the sweetest herbage first. It appears most injudicious to congregate different classes of animals, as they are apt, from their respective habits, to interfere with the comforts and repose of each other. Horses and cows do not mingle sociably together, nor eat exactly after the same mode; but horses and sheep, both biting closely and quickly, are fit followers together after a leading stock.

> "But there are other points of more consequence, that seem to favour the feeding pasture-lands in a divided state; such as those of the cattle not grazing so quietly in large herds, as in such as are smaller; and, where any disturbance happens, either from accident or necessity, the whole being disturbed instead of only a part. Besides, it has been found, that all sorts of stock, when duly proportioned to their pastures, thrive better in small than in large numbers together, being less liable to tease and disturb each other."*

The number of animals that may be fed on any given area, must depend on the soil, the properties of the grass, and the size of the animals, and also on the length of time the land has been in a state of sward, as new leys are seldom so capable of carrying so much stock to the acre as older ones.†

A grand rule in grazing is, to eat down all the grass, particularly when vegetation is rapid, that the shoots may be vigorous, and not mature their growth so as to exhaust the land; but land should never be overstocked, for when fed too bare it is burned up in summer, and chilled in winter, and the crowns of the plants are so cropped that they will not push forth a due succession of blades; and if, on the other hand, much grass is left, especially on marshy land, and towards winter, the herbage of the next season will be of the coarsest kind. The season at which pasture may be first fed in spring, must depend on the climate, the particular season, and the quality and locality of the pasturage.

On land in which coarse plants abound, it is desirable to put on the stock when those are in their early growth, for if they be not eaten down then before the ground is covered with better herbage, they will not be consumed at all. It is not necessary to have a full bite at first, especially after dry winter food, for the want of succulence on the first transition to soft green food is of advantage to the cattle, which gradually become accustomed to the change in their dietary. From the end of March to the end of April, on an average of situation and seasons, may be considered in our southern counties as the best time for turning cattle to pasture; but in the northern parts of our islands, from a fortnight to a month later is the usual season. In most parts of Scotland there is rarely a spring of grass before May.

When furze, briers, broom, &c. grow up, they should be extirpated, else the herbage around them will be rendered distasteful. They should be dug out completely in the spring, and even the thorns and briers which grow on the margin of the ditches should be grubbed out, especially on sheep-pasture, as they injure the fleece, and torment the sheep by entangling them in it.

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* Irish Farmer's Journal.

† Ibidem.

And noxious plants, such as hemlock and nightshade, should also be carefully eradicated, for though, while grass is abundant, cattle will instinctively avoid what is hurtful to them, they may not be sufficiently cautious when it becomes scarce.

Where rushes or any other coarse aquatic plants appear, it is certain that the land wants drainage.

PEAT. See *Bog*.

PLOUGH—An implement for turning up or loosening the surface of the soil. This is effected by its being pulled horizontally along, and cutting off a slice and turning it over so as to separate whatever vegetable matter had been growing upon it, and expose a fresh surface. This instrument of husbandry is of very ancient invention, though extremely rude and ill-contrived in its construction, until the skill of modern times has rendered it effective. When it is considered that no implement is of more general use, the wonder is, that it has been so long neglected, even by persons of mechanical genius, as a rude tool, unworthy of their attention, because it has happened to be in the hands of the ignorant peasant, who contrived to execute his task with clumsy success. The principle upon which the plough is framed, is that of the *wedge*, by which it meets and overcomes the resistance which the soil opposes; and by the judicious combination of the different parts of its frame, it not only with *facility* enters and loosens the soil, but lays it over in the best possible manner.

Happily the true formation of a plough, and correct adjustment of its several component parts, is now perfectly understood by the scientific mechanic; and though some ploughs excel others in their mode of operation, and in reducing the ground to that broken state which the spade so much more thoroughly effects, the difference in the *style* of work executed, and the facility with which it is performed as regards the horses and the ploughman, depend *now* much more on the degree of practical skill possessed by the latter, than on the construction of the plough itself, which, wherever Scotch husbandry prevails, is a superior, and yet a simple piece of mechanism.

It has been just observed, that the principle of the wedge is that on which the plough operates. Without having recourse to the aid of *Euclid*, we can state, in a general and plain way, the form and construction of the important instrument under immediate observation.

The plough, if not apparently so, is yet in reality a *wedge*, though not of one solid piece, but of combined parts, all tending to the same object, while operating in different ways. The chief parts of this moving wedge are thus described:—the *coulter*, (which is made of malleable iron, steeled at the lower end and the edge, and always set with a good rake forward,) makes an incision, and opens the way for the *sock* or *share*, which, with its feathered edge, gets under the sod, and lifts it up, at the same time heeling it over. Mr. Finlayson, to whom more particular reference will soon be made, says, "the best formed sock I ever saw, on a common plough, for the purpose in question, (cutting heath,) had a feather 19 or 20* inches long, and 10 from the land side at the outer extremity." And again, "some people suppose, that an edge cannot be too directly opposed to that which it is intended to cut; so that, to give as little *cutting surface* in some, and for the sake of *rid* in others, many ploughs are to be seen, with their coulters standing in nearly a vertical position; and having long shares with short feathers jutting abruptly out. * * * It might be sufficient to ask, why a knife does not cut a slip of paper so clean, with its edge opposed, as with its back inclined, or wherefore he (the mower) mows with a scythe four feet long, placed at an acute angle with the helve, in lieu of one 18 inches long, standing in a straight line with it."

The *mouldboard*, which is the most delicate part, and on the curvature and length of which much of the correctness of the ploughing depends, pushes the sod aside, and turns it over as far as is required. According to Finlayson, this should be longer for heavy than for light soils. The height of the mouldboard at the back part, where it is of greatest dimensions, should be just sufficient to prevent the earth, or furrow-slice, which it pushes aside, from being thrown back over it in its progress. The iron at the base is called the *sole*, and the breadth of this, at the back part called the *heel*, regulates the width of the furrow.

> "The *beam* is that part of the plough to which the moving power is attached. Upon the end of the beam is placed a *bridle*, to which the point of draught is fixed, and by means of which the line of draught can be elevated or depressed, and moved to the right hand or to the left, as may be required. The bridle (also called the muzzle) is curved in its form, in order that, being more elevated above the surface of the ground, it may be less impeded by stubble and other matters upon the surface."†

A long beam causes the most steady motion, being less affected by inequalities in the land, but nothing very precise is laid down to regulate this point, and there is much diversity of opinion regarding the length. Some writers have fixed the ratio at 33 inches for the elongation of the beam, to 9 inches of breadth. The length of the beam of an ordinary Scotch plough, is from 6 to 7 feet.

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* His own heath-cutting patent plough has a feather of 30 or 34 inches long, and has a triangular piece of steel inserted at the extremity by a peculiar screw.

† Low's Elements.

The *handles* or *stilts* are levers by means of which the ploughman regulates the movement of the plough.

A fundamental rule in the construction is to have the sole straight from the point to the heel, for any projection deranges the groove in which the plough moves, (which should be in a perfect plane,) and expends power in doing mischief.

The only remaining parts are the *swingle trees,* which should be of light, but firm wood or iron, with rings at the extremities, and hooks and chains to connect them with the bridle. The *double* tree should have three or four holes in the middle, for the purpose of giving, if necessary, the longer end to the weaker animal. The draught-chains from the swingle-trees to the collars should be in a straight line, and (without forming any angle) prevented from falling down in turning, by the bands over the horses' backs, to which they are hooked, "and the line of draught goes from where the theets (backbands) are suspended, to the centre of the cutting surfaces of the coulter and share."

Generally the point of the sock has a dip downwards, so that if the plough were left to itself, and merely kept straight, its tendency would be to go deeper than is required. We cannot defend this mode of setting the share on any sound principle. Nor should the coulter ever be upright, for when "at right angles with the line of progression it offers the greatest resistance that it is possible for it to make;" it should so slant that "the uplifting power of the team (so necessary in all draught) is fairly balanced by the tendency which the plough has to dip in the soil."* When the coulter is too near the sock, stones are perpetually caught and entangled. In stubble-ploughing it should be two inches from the sock. It should also incline a *little* to the left-hand side, but the principal rule to be observed is, that it should be in the line of the plough's traction. On the breadth of the sole at the heel depends the width of the furrow; a greater width than nine inches is unnecessary, for a horse and man can walk within this limit; and if it be wider, there is, of course, greater force required for pushing the slice aside, "and a broad sole does not give it more room to stand, for whatever is the breadth of the furrow, the successive slices will be left at their former distances, because each is moved aside to the same distance."†

Mr. James Small, a plough-maker in Berwickshire, had the merit of introducing what is called the Scotch swing-plough, which is drawn by two horses, and capable of executing almost every description of ploughing, and he published a plain treatise intelligible to those for whose use it was intended. Wilkie, who took the hint from Small, improved considerably on his suggestions, and has produced the very best modern plough.

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* Finlayson.

† Encyclopædia Britannica.

Small's plough was of wood, the base being hardwood pointed to receive the sock, and tapering towards the heel. Almost all the later ploughs are entirely of iron, and consequently more durable as well as more steady and more easily drawn. The Scotch plough is made light enough for one horse, in drill culture, and has variations in the degree of concavity in the mouldboard, according to the nature of the soil—that which is clayey requiring the least degree of concavity, and that of opposite quality the greatest.

Mr. John Finlayson—also a Scotchman—(referred to in a preceding note)—invented some years ago a very useful kind of plough, which he called "the self-cleaning plough," for ploughing heaths, stubbles, &c. and has published a truly clever and practical essay on the subject. To this we are indebted for the information immediately succeeding.

> "The working parts of a plough are composed of three *inclined planes*: the edge of the coulter as opposed by the sole of the share, one, operating vertically; the edge of the feather as opposed by the land side of the share, a second, operating horizontally; and the upper side of the share and mouldboard, as opposed by the land side, and sole, a third, assisting the other two in a mean or diagonal direction."

The plough, as a wedge, opposes the smaller end to resistance first, and then forces its whole frame through the resisting medium. Inasmuch as the wedge tends to raise up the earth, the earth presses down the wedge, and as the wedge pushes the earth to the right hand, the earth presses the wedge to the left, and in this manner the plough is strongly pressed both to the bottom of the furrow by its sole, and also to the firm land by its back or land side; in short it is driven by these opposing forces into the furrow which it forms, and which becomes a firm groove directing the motion of the plough, and giving it a resisting support by which it can perform all parts of its task.*

Mr. Finlayson inquires, who then, having three wedges to raise a great weight, would only use one at a time? Who, ploughing tough ley, would throw aside the coulter, beat in the feather, or contract the mouldboard? Who is there, among the tens of thousands who get their socks made an inch-and-a-half or two inches broad, and square in the point, that can give one good reason for so doing? Absurd as such questions may appear, it is yet too common to see the pliable fibrous slice *torn* instead of being *bent* and cut; the "stubborn glebe" *forced* principally by the edge, in place of the *wedge;* the friable mould or crumbling sand opened first by an acute, and secondly by an *obtuse* wedge, instead of *one continued inclined plane.*

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* See Encyclopædia Britannica.

> " The sole (as it ought at all times to be) is quite straight from point to heel. It bears all along the same degree of weight, and that only of the plough, in the same manner as if it was sliding on the surface; for it has no greater tendency upwards than downwards, and the ploughman has as little necessity to increase friction, and provide labour for himself, by any untoward means whatever."*

The correct set or turn of a plough is perceived by its steady movement without any effort on the part of the ploughman.

> " In order to prove whether the plough will be under perfect and easy management, hook the draught-chains as high as possible. In this case the plough should have a continual tendency to rise at the heel, and even to run a little into the ground. Then hook the rope as low as possible; the plough should then press hard on the furrow with the heel, and have a tendency to run out of the ground. If both these are observed, the plough is in trim; if not it must be altered by lowering or raising the end of the beam."†

The Scotch swing-plough has not, with all its undoubted merits, superseded the old Walloon plough with wheels, in many parts of England, where the most unaccountable waste of animal labour, in ploughing, regularly and systematically takes place. The Rotherham plough, that which probably suggested to Small his superior construction of implement, is the nearest approach to it, which the prejudices of some otherwise very intelligent farmers will admit, even in some of those English counties where husbandry is pre-eminently good.

This is a swing-plough not differing very much from the present Scotch plough. It was made at Rotheram (in Northumberland) nearly two hundred years ago, by a person who had learned the principles in Holland, and it is now used in many parts of England. The present Belgian swing-plough is formed on the same model.

The Welsh plough, extremely like the old Irish wooden plough, is still a favourite in some of the most civilized parts of South Wales, and perhaps a more awkward one for the purpose for which it is designed can hardly be imagined. It does not cut, but it tears open the soil by main force. A statistical writer thus describes it, and the indisposition of the Welsh to adopt one of any better construction:

> " The share is like a large wedge; the coulter comes before the point of the share sometimes, and sometimes stands above it; the earth-board is a thing never thought of, but a stick (a hedge-stake or any thing) is fastened from the right side of the heel of the share, and extends to the hind part of the plough; this is intended to turn the furrow, which it sometimes performs, sometimes not; so that a field ploughed with this machine looks as if a drove of swine had been moiling it.

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* Finlayson.

† Encyclopædia Britannica.

> "The Rotheram and other improved ploughs are in use among the proprietors and book-farmers, and the Scotch plough is coming into very general use. A gentleman, a naval officer, in Cardiganshire, introduced the light Rotheram, and insisted on his ploughmen using them. As soon as he turned his back, the new ploughs were dismissed the service, and the old ones were brought into the field. One day, in a rage, he committed the old to the flames, and set the new ploughs a-going. Afterwards, taking a ride to cool himself, and returning, he found the new ploughs in the ditch, and old ploughs borrowed from the neighbours, at work. The master then thinking it useless to persevere, gave up the contest. 'I have,' said he, 'seen various kinds of human beings, in different parts of the globe, from latitude ten to latitude fifty-four, but none so obstinately bent on old practices as the Welsh.'"

The description above precisely applies to the old Irish plough, which, from want of a proper mouldboard, required the constant application of the ploughman's foot to keep down the furrow slice; as the plough advanced it was only partially turned over, and without the assistance of the foot it did not occupy its proper place. This, as may be supposed, was very laborious to the ploughman, who had only one leg to hop upon, the other being constantly employed as we have stated—in kicking—while his hands and trunk had severe labour in pressing the plough downwards towards the muzzle, contrary to its upward tendency.

The Somerville plough, invented by Lord Somerville, is another swing-plough which was used in England, but is now little known. Its peculiarity is that of having part of its mouldboard rendered moveable by hinges, so that, the inclination of the furrow may be made more or less upright.

The *turn-wrest** swing-plough is so constructed (having two coulters and two mouldboards) as to admit of throwing the furrow to either side as may be desired, by taking off the mouldboard and coulter from the opposite side. This is only useful in steep fields where it may be convenient to turn the furrow-slice to the left side instead of to the right.

> "In some cases, where the declivity is great, a furrow can only be taken down hill, which is a very tedious operation, whereas a plough of this form, in which the mouldboards are easily shifted to any side, may be employed with less labour to the cattle, and with greater expedition, because the ploughman, having it in his power to turn the earth of the furrow-slice either to the right or the left, according as it answers his purpose, can always turn it to the lower side, when he is ploughing in a diagonal direction, or straight along the side of a steep hill."

The reader may see the plan of construction and farther description in Loudon's Agriculture, whence the above extract has been taken. The compiler of that work says of this plough, "in short, this is one

* By wrest is meant mouldboard.

of the best implements of its kind, and where the use of a turn-wrest plough is recommended, no other variety will be found to equal it."

Ducket's skim-coulter plough, for opening the ground in distinct horizontal portions, to any depth, for burying weeds, &c. is used, but not frequently. It requires a considerable strength of team to draw it, but, as it acts like a trenching-plough, and saves much subsequent labour, it has considerable advantages.

"In thin and sandy soils, it is more particularly useful, because it cuts off all which is on the surface, at the depth of an inch, or an inch-and-a-half, in order to its being laid in a state of decay, for a future crop, by which an increased depth of soil is given to every subsequent course of crops, and which often acts as a support, to keep up manures near the surface, as their running through such soils too quickly is a disadvantage. It is also capable of being made use of without a skim-coulter as a common plough."*

There are also swing-ploughs with *double shares*, one over the other, to plough in completely and deeply, manures, and green crops, such as rye, &c., and the double-furrow plough which cuts two furrows at the same time. Lord Somerville brought this into notice, and added his favourite mouldboards.

"But with all the improvements made by Lord Somerville, it can never come into competition, for general purposes, with the present simple furrow-plough. Lord S. admits, that it would be no object to invade the system already established in well-cultivated countries, though, where large teams are employed, with a driver besides the ploughman, it would certainly be a matter of importance to use this plough, at least on light, friable soils. 'Their horses,' he says, 'will not feel the difference between their own single-furrow, working one acre, or the well-constructed two-furrow plough, with two acres per day; here is no system deranged, and double work done."

The *Argyleshire* plough, invented by the Rev. Alexander Campbell, who obtained the gold medal of the Highland Society for his ingenuity, has, instead of a coulter in the beam, a knife rising from the left side of the share, which cuts off the furrow-slice like a coulter. The advantages are said to be, that it is not so liable to be turned out of its course by stones or other impediments, nor to be choked by stubbles, &c. as other ploughs. It is also easily drawn. But the only really good purpose which it serves—that of being self-cleansed from stubbles and heath, and similar objects—is far better obtained by Finlayson's patent plough already alluded to. This is thus described by Loudon:

"Finlayson's *rid plough* is Small's plough formed of iron, with a crane-necked beam rising from the point where the coulter enters it, so as to form an easy curve with the top of the coulter. By this means whatever stubble, roots, or other rubbish the coulter may collect, rises or is forced upwards, follows the curve till coming under the beam it drops, and is either buried in the present furrow, or lies to be interred by the next, according to the side on which it drops."*

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* Loudon.

Besides its utility in disengaging itself from obstacles on the surface, it can act like the subsoil plough, in following *another* plough, stirring the under surface to the depth of 13 or 14 inches; but from the lightness of ordinary structure, and adaptation to the pull of a pair of horses, it would not long bear the necessary strain in stirring the subsoil, unless in very loose and porous land, where it would be quite unnecessary in this respect.

But for the purpose for which it is designed it answers perfectly. Mr. Finlayson himself has thus described it—

> " The coulter and beam form a semicircle of about 22 inches diameter, with the concavity towards the muzzle, *i. e.* taking the coulter from within six or eight inches of the point for so many degrees; and the beam from where it is inserted to about 20 inches forward from the remainder. The other half of the beam makes a regular round turn downward and forward to the muzzle."

This curvature allows heath, stubbles, or roots that may not be cut in the progress of the implement to pass freely underneath. It clears itself completely, and therefore saves the ploughman all delay from weeds or grass, which in ploughing heath and high stubbles occasion serious delay.

A *Skeleton Plough* for cutting the furrows, so as to raise and loosen earth for covering corn in ridges by the subsequent operation of the shovel, is among the numerous varieties of the implement. This is merely a plough without mouldboards, each of the handles forming the same angle with the beam, and the sock having a double edge.

In a broad trench it should be first run through the centre, and then at each side, so that the whole soil therein should be completely pulverized for the action of the shovel. This plough, with mouldboards put on by hinges, acts as a moulding plough for potatoes, rape, &c., and may be also rendered a paring plough, by adding two hoes or coulters instead of the double-edged share.

Morton's universal drill plough is one of the best of this kind; when the mouldboards are removed, two circular coulters (or scufflers when required) are fixed to the expanding arms for paring the edges of the drills; and these arms are taken off when the mouldboards are to be put on. There is a curved coulter to be inserted in the usual way before the double-winged sock, when the plough is used for moulding.

Another description of plough for the same purpose, but especially for a dry soil, has been introduced into Norfolk, by Sir Edward Stracy, Bart. The results have been thus recorded in the Bury Post:*

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* Finlayson says that he had Wilkie's iron plough in view when constructing this.

> "Scotland has taken the lead in this improvement, (that is, draining and subsoil ploughing;) but Norfolk is fast treading in her steps. Hitherto, indeed, the subsoil plough has chiefly been confined to our hard, gravelly, or chalky-bottomed land, where it is scarcely less efficacious than on wet clays. Sir E. Stracey observed in a letter to the writer, 'I have broken up nearly 500 acres of heath land with this plough; my crops have been almost doubled, the wheat produced on the land so broken up has been plump and fine, weighing 63½ lbs. per bushel, and has fetched the best price in the market; when, before the deep ploughing, the same land scarcely produced the seed, and the wheat was so poor and shrivelled, that nobody would look at it.'"

For the important purpose alone of loosening the subsoil, without bringing up fresh surface, the subsoil plough constructed by James Smith, Esq., of Deanston Works, is an invaluable implement. We give the account in the words of the author and inventor himself, and recommend his pamphlet on Thorough Draining and Deep Ploughing, as explanatory of his own principles, and affording the best instruction as to the details of practical draining:—

> "The subsoil plough, of which an elevation and bird's-eye view are given on the adjoining plate, was designed by the writer of this article, about nine years ago, for the purpose of opening up the close subsoil of the farm of Deanston.
>
> "In the design, two essential points were kept in view—1. The construction of an instrument that would effectually open up the subsoil without throwing any of it to the surface, or mixing it with the active or surface soil.—2. To have an implement of the easiest possible draught for the horses, while it was of sufficient strength and weight to penetrate the firmest ground, and resist the shocks on the largest stones.
>
> "The extreme length of the plough is about 15 feet. From the socket at the point of the beam to the first stile or upright, 6 feet; from thence to the back of second stile, 19 inches; from thence to the outer end of holding handles, 7 feet; from the sole to the bottom of beam at stiles, 19 inches; length of head or sole-bar, 30 inches; from heel of sole to point of sock, 46 inches; broadest part of sock, 8 inches. The coulter is curved, and in order to prevent its point being driven from its place by stones, it is inserted to the depth of an inch in a socket. (*a*) The lateral dimensions of the sole-piece are 2 inches square. This is covered on the bottom and land side with a cast-iron sole-piece, to prevent wear. The sock goes on the head in the usual way, and from its feather rises the spur-piece, (*b*) for the purpose of breaking the subsoil furrow. When the subsoil consists of very firm clay or other hard and compact earth, the feather and spur-piece may be dispensed with, and a plain wedge or spear-pointed sock, such as those of the old Scotch plough, may be used. The draft bar (*c*) of 1¼ inch round iron, is attached to the beam at the strong eye, (*d*) and passing through an eye in the upright needle, (*e*) is adjustable to any height or lateral direction, being moveable in the socket, (*f*) at the point of the beam, and can be made fast at any point by a pinch-

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* 23d March, 1839.

direction of the power of the horses is so regulated as to render the guiding of the plough easy at any depth or width of furrow. The beam is about 5 inches deep at the middle, and 1¼ inch in thickness—towards the draft end it tapers to 3 inches deep, and 1 inch thick; at the holding end where the handles branch off, it is 2 inches by 1. The whole weighs 440lbs. imperial. This appears an enormous weight, and most people are alarmed at the strength and weight of the implement, but after repeated trials with lighter ploughs, those of the dimensions and weight now described have been found to be at once the most efficient, the most easy of draft, and the easiest for the ploughman to manage.

"Four ordinary farm-horses are generally sufficient to draw this plough in breaking up subsoil of ordinary firmness; but on very tough clays, or in hard till, it may be found necessary to use six horses. When four are used, they are yoked two and two, by draught-bars and chains, as shown in fig. 4. When six are used, they are yoked three and three, by draught-bars and chains, as shown in fig. 3.* The main chain for the leading horses to pull by is hung, in both cases, by links from the collars of the rear horses, to keep it up from their legs, and the trace-bars of the leaders are kept close up to their hams by cross straps on their quarters.

"When horses, which have been accustomed to work in pairs, are first put to work in this plough, they are apt to be a little restive, and do not at first pull well together, and this is especially the case when the subsoil is stony. The ploughman also finds some difficulty in balancing the plough at first, and if he is not a man of quiet and firm temper, the whole affair puts on the appearance of an arduous and hopeless undertaking; a few hours or days at most, however, of temperate perseverance will overcome all difficulties, and horses and men will work together with steadiness and effect. The work is, indeed, in most cases severe, and the horses are frequently warm and fatigued; but to insure good farming, the work *must* be done, and will amply repay all the trouble and expense. When a field or farm has been once efficiently gone over with the subsoil plough, it is not again necessary to repeat the operation, as the original stratum of the subsoil has been completely broken up, and all land stones which offer any serious obstruction to the plough have been removed. In after operations of deep ploughing, the work should be performed by an implement in all respects resembling the common plough, either Small's, Wilkie's, or the old Scotch plough, but of double the dimensions in all parts. In free soils, four horses yoked two and two, are sufficient to plough to a depth of sixteen inches; but in heavier soils, six horses, yoked three and three, will be found necessary. This plough, which may be called a trench plough, should be applied once in each rotation of cropping, and the best time is in giving the first furrow for green crop, or in the event of summer fallow being followed, in the first furrow of that operation; this plough makes a mixture of the soil and subsoil, for which the latter has been prepared by the admission of air and water from the effects of the subsoil plough.

"The operation, both with the subsoil and trench plough, should run at right angles to the line of drains, as channels are thereby opened for the rain water to flow towards the drains. When drains have been sometime executed, innuing screw wrought by the lever. (*g*) By the proper setting of the draught-rod, the merable small fissures will be found in the subsoil, extending from drain to drain; these are caused by the contraction of the substance of the soil arising from its drier state—the contraction being greatest in the stiffest clays—the operation of the subsoil plough admitting the air to a greater depth, the fissures take place under its operations, and generally reach to the level of the bottom of the drains. These fissures will get more or less silted or glutted up from time to time by the minute diluvial particles caried down and left in filtration by the rain water, but the constant expansion and contraction of the unremoved subsoil, by the alternations of wet and dry, has a perpetual tendency to renew them; so that so long as the drains flow freely, there will never be wanting minute channels for the percolation of the water from all parts towards the drains.

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* In No. 44 of the Quarterly Journal of Agriculture, are the details of a mode of yoking the horses practised by Mr. Laing, of Campend, near Dalkeith, by which the draught is more equalized, and the plough more easily held.

"A subsoil plough costs from £7 to £8, and a full-sized trench plough from £4 to £5; and it is hoped that any plough-maker will be able to make them from the preceding description, and annexed plate.

SUBSOIL PLOUGH.

Fig. 1.

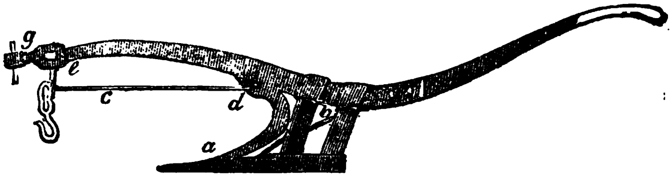


Fig. 2.

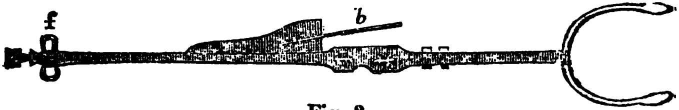


Fig. 3.

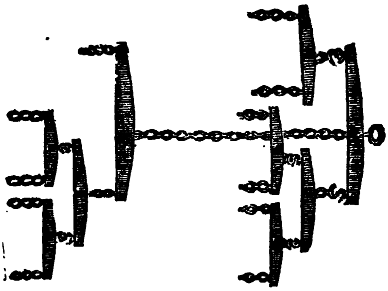
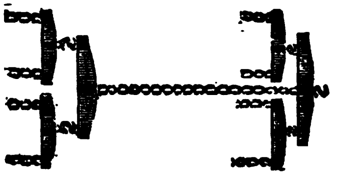


Fig. 4.



"Mr. Murray, of Polmaise, has just had a plough constructed on the principle of the subsoil plough, but of smaller dimensions, and weighing only 168lbs. imperial, which in dry field soil, with a *moorband* bottom, has been drawn to the depth of sixteen inches, and proved effective in breaking up the subsoil, and turning out stones of considerable size.

"In the experiment alluded to, the plough was drawn by three horses, so yoked that two go in the furrow, and one on the unploughed land.

"Price of this plough about £3 3s."

As might have been expected, the substitution of steam for animal power to the plough, has been tried, and with considerable success, on a large tract of level moor, though it remains to be ascertained whether the complicated machinery connected with it can be brought to bear with effect and economy on a moderate scale of husbandry.

The credit of the experiment is due to John Heathcoat, Esq., M.P. for Tiverton, who made a public trial of his steam plough on one of the great moors of Lancashire, in presence of a highly distinguished deputation from the Highland and Agricultural Society of Scotland. For a description of the complex machinery and its action, we refer to the 37th No. of the Quarterly Journal of Agriculture. We can only briefly advert to it here. By placing the steam machine in the central line of the field to be ploughed, with two auxiliary carriages in parallel lines with the other, one at the right side and the other at the left, and each at the distance of 220 yards from it, two ploughs are kept going to the right and to the left, by bands coiling round the auxiliary machines and the principal, each 660 yards long, passing from each side of the principal machine. " When the plough has reached the auxiliary, the motion is stopt, the plough is set to the next furrow, the motion of the steam engine on the pulleys is changed by shifting a clutch from the one to the other, and the pulleys reverse their duty, that which was uncoiling now becoming the coiler, and so on alternately."

" The plough has but a distant resemblance to that in common use; it is double, that is to say, has two sets of stilts, one set at each end, and each set consists of four handles, it being occasionally found necessary to employ two men to guide the coulter; it has two shares, coulters, and mouldboards, together with all the peculiar apparatus applied to these purposes; but it may be said to have no beam. The mouldboards are both on one side, set tail to tail, so that the plough acts to and rom the machine without turning round."

Mr. Heathcoat himself has given a description which represents (as far as it can be understood without actually seeing the machinery) what the foregoing quotations from the Quarterly Journal do not completely explain.

" In commencing the reclamation of a bog, a roadway is first to be traced out in a suitable direction, for the proposed operations. This is done by simply forming two drains parallel to each other, and about seven yards apart. The principal machine is launched on this roadway (still retaining its natural surface.) The machine rests on the raw bog, and bears on so large a surface, that its buoyancy is insured. It also consolidates and dries the roadway by its pressure.

"The machine and its auxiliaries remain stationary during the time occupied by the ploughs in taking one furrow; they are then severally put in motion, and made to advance in three parallel lines, in order to keep pace with the breadth of land turned over, and to pull the ploughs accurately straight. The machine is impelled by the engines, and each auxiliary by its attendant man, who also shifts his planks onward as occasion requires. The machine and its auxiliaries have thus to be moved over a space of 18 inches only, whilst the ploughs have each travelled 220 yards, and turned over 220 square yards of land, 9 inches in depth; in other words, the machine and auxiliaries have only to be moved 11 yards, in the time that the ploughs have travelled 5½ miles, and turned over a statute acre of land. The ploughs perform their work at the rate of 2 miles an hour, and are subject to very few stoppages; so that, 8¾ acres nearly of bog would be ploughed up in a day's work of 12 hours—or, taking the average of day-light throughout the year, and making a liberal allowance for hindrances from weather and other causes, one machine would plough up 2000 acres in a twelvemonth."

There ought to be a perfect and thorough draining of the land before the subsoil ploughing takes place, else its proper design and purpose will be lost. Some persons either neglecting or misunderstanding Mr. Smith's caution regarding the *uniformity* and *completeness* of previous draining, have taken it into their heads that the subsoil plough is a *substitute* for draining, or may, at least, be effectively introduced without the previous drainage. This is quite opposed to Mr. Smith's theory and practice; he maintains, and very justly, that stirring the subsoil will only increase the capacity of the land for holding water, without providing for its removal.

The subsoil plough, besides its use as an accompaniment to furrow, or other draining, acts most beneficially in breaking up what is called the *moor-pan*—that otherwise impenetrable and impermeable crust which so often lies under the upper soil and prevents the percolation of water downwards. The breaking up of this obviously tends to render the surface dry and friable.

Nor is the good effect of stirring the subsoil by means of the plough (which it does at one-fourth of the expense of trenching with the spade) confined to clay-land alone, though on this it acts with perfect efficacy; for it has been proved to render the lightest soils also more fertile, by admitting the air to the substratum, and by allowing the fibres of plants to penetrate more deeply there in quest of nutriment. A communication has been published by Charles Shaw Lefevre, Esq., M.P. in the Journal of the English Agricultural Society, from which it appears, that in consequence of hearing "the interesting evidence of Mr. Smith, of Deanston, before the Agricultural Committee, in the House of Commons, it occurred to him to apply the subsoil plough which had worked such wonders in a clay-soil, to a dry, burning gravel."

The effect of the experiment is shown by a statement of the produce of the field (consisting of six acres) for a series of years :

Year.	Crop.	Produce per Acre.
In 1832	Oats	4 sacks.
1833	Turnips	Not quite 2 tons.
1834	Barley	Not quite 4 sacks.
1835	Clover	2 tons on the whole field.
1836	Wheat	3 sacks.

In the autumn of 1836 it was ploughed with the subsoil plough, at a cost of 30s. per acre.

Year.	Crop.	Produce per Acre.
1837	Turnips	8 tons per acre.
1838	Barley	10 sacks per acre.

In other respects the land received the same treatment during the whole of this time. There is at present a fine plant of Dutch clover in the ground, which promises to prove an excellent crop.

The *trenching plough* differs from the subsoil plough in bringing up a fresh surface, which, in many instances, is necessary, but has not altogether such corresponding good effects. Every day adds fresh testimony in favour of the subsoil plough.

Double and single *wheel*-ploughs are still much used in England; but a good ploughman requires no wheels, which, in heavy land, occasion increased resistance.

The Norfolk wheel-plough has two wheels, and in light soils requires a small power draught, but it is a cumbrous machine, and not to be compared with the Scotch swing-plough.

Finlayson condemns wheels in toto. He says,

> "Wheel-ploughs ought, in every instance, to be abandoned. They can only make equal work with the swing-plough on land that is quite smooth. They are more expensive and cumbersome, more apt to get out of trim, and worse to put in repair. But, more particularly, because in them the line of traction is perverted; the uplifting power lost; friction increased; and the irons made to move in a different direction from that to which they point, otherwise the wheels are an unnecessary appendage; so that all of them, with a wheel or wheels under the beam, must require a greater force of draught than a swing-plough; and some, perhaps, more than double."

The Kentish plough, (the old Walloon plough, still partly used in the Polders of Belgium, and in some of the *very* heavy land in the interior of that country,) with a turn-wrest on Lord Somerville's plan, is a very heavy and clumsy machine, but a favourite with some farmers on clay soils, and especially in Kent, where the style of agriculture is proverbially excellent. All the draining-ploughs have usually one or two wheels; some of these require six horses to draw them.

The mole plough is one of the most curious of these draining-ploughs; it moves along in grass-land like the *mole*, underground, where there is a sufficient fall for the water, without opening the surface more than is sufficient for the passage of the coulter, which leaves no permanent scar; the drains are cut closely and at proper distances. See *Draining*.

Draining by means of this plough appears highly extravagant, when the expenses of the giant team required to draw so ponderous and costly an implement are calculated, and the uncertainty that these drains will remain free. It is undoubtedly better to use manual labour, and lay regular drains. All the above implements must be seen to be understood.

PLOUGHING—The act of breaking up land by means of a plough. Under the head of *Fallowing* almost all that is essential upon this subject has been already noticed. On *deep* ploughing, occasionally, the success of crops mainly depends; but the depth must vary with the nature of the soil, and of the crops. The seed-furrow should be lighter than the others.

In *preparing* land for crops, the depth of the furrow-slice (when the soil will admit of it) should be equal, or nearly so, to the breadth; 9 inches deep, and 10 or 12 wide, is a good proportion, but we should prefer a depth of 12 inches in fallow-ploughing.

The angle at which the slice should be laid, so as to expose the greatest surface, is 45°;* and this, for harrowing in oats, or tares, is the very perfection of ploughing; and, as a general rule, it may be noticed that the degree of inclination will depend on the ratio between the width and depth of the furrow-slice—the greater the depth, the higher the slope. When the breadth exceeds the depth, and the slice is turned on its side, it stands on a narrow base, but higher than before, and will stand looser; but in this case it falls on its back before it is pushed far enough, and with the grassy side down, as is the favourite position for ley in Ireland, when it is intended to sow wheat or oats upon it, to be covered from the earth in the furrow, by means of spade and shovel. When the depth much exceeds the breadth, the sods turned on their sides must be squeezed home to the ploughed land, which places them upright, and makes rough work.

On the whole, it is better to have the length and breadth nearly equal.

It is not a good plan to turn fallows intended for immediate seed-sowing, if it can be avoided, in very dry and hot weather, nor to plough between drilled green crops, especially in sandy and gravelly soils, on account of the increased exhalation of moisture, which should, as far as possible, be preserved in the soil.

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* This is demonstrated in a diagram by Low.

By ploughing judiciously, soils of opposite qualities may be, in some cases, usefully blended, and the staple increased. But deep ploughing, however occasionally necessary, if persevered in, would be often injurious; and in some cases it should be light, else the manures would be wasted, and the fertile parts of the earth buried. Lime, marl, and gypsum, should be lightly turned in, from their tendency to sink, and not applied until immediately before the *last ploughing* or harrowing; and in giving the first ploughing to ley land intended for fallow, it is maintained by many, that the sod decomposes more rapidly by not being deep. The properties of animal and other volatile manures, however, cannot be lost by a deep covering.

Early spring ploughing should be as much as possible avoided in clay lands.

The business of ploughing may, in most instances, be sufficiently executed by the Scotch swing-plough, and a pair of strong horses, or three abreast; but in such soil as that of Kent, the ponderous wheel-machine used there, and called a plough, with a heavy team, *may* perhaps be better.

PLOUGHMAN—The man who guides the plough. Columella says of the Roman ploughman, in his day—

> "We should make, as I have said, the tallest man a ploughman, both for the reason I have already mentioned, (*genius*, and harshness of voice and manner, to *terrify* the oxen,) and because there is no rustic work by which a tall man is less fatigued than by ploughing; because, when employed in this, walking almost upright, he may lean upon the handle of the plough."

Finlayson, who probably never read Columella, remarks very shrewdly,

> "It is no matter what he has been, or intends to be, if possessed of sufficient physical strength, he is also sufficient to be thrust between the horns of the plough, which he knows nearly as little about as of the plough in the firmament—quite competent to take under his dominion two of the noblest and most useful of animals, the economy of whose feeding, cleansing, harnessing, training, working, &c. he is as ignorant of as of rearing and breaking the camel or dromedary; * * * and ignorant whether the troubles of his tortuous passage depend most on himself, the yoke, or progress of the horses, or on the construction or trim of the plough."

We go on and conclude this article with the observations of this writer, which so accurately convey what we would have generally understood by the farmer.

> "Nothing can be more beautiful than a field commodiously laid off, and neatly ploughed. There is even none of men's handiworks that can please the eye more,

and, at the same time, show more of its unruled accuracy, than a lawn which presents ridges of the same width, with furrow-slices running in straight, equidistant lines; and that, too, with such minute exactness, as scarcely to be surpassed by the mechanic, working by squares, rules, and plummets, and by no means equalled by the gardener, with all his lines, directors, and nice assistants. * * * *

"It is not the man who makes the greatest ado with the horses, who opens his ridges best, but more commonly he who goes steadily and directly forward himself, and keeps such a command, by the reins, as to prevent them from deviating far from the right path, yet without laying *too much stress on their precision*, or checking them suddenly from one side to the other; and he who can take a straight furrow at first, and continue so to the last, even on a ridge of fifteen feet, will finish with one, two, or three bouts less than one who is all along undoing and overdoing, and that, too, independently of the ease to himself and his team, and the preference of the work, in every respect.

"If broadcast ridges are of unequal breadth, bended or zig-zag, the work cannot be so uniform, and in the turnings much time is lost, and harm done to the land which is ploughed; and with crooked drills there is a loss of ground, an unequal distribution of manure, if such has been applied, and the hoeings cannot be so effectually done where they are far distant, or done at all, without soddening the mould, and injuring the crop, where they are narrower.

"In fine, the grand criterion of ease and proficiency is, that of the ploughman's walking between the stilts, and in the furrow, with a free step, and erect body; for thus he is more convenient for himself, has the horses and the plough better at command, and increases not the friction by his weight; for thus *he cannot go*, excepting the horses and the plough are properly adjusted, and proceeding with the least possible obstruction; and thus, too, he is more graceful to look on, than when wriggling with one foot foremost, or moving as if part of his muscles were under the domination of violent spasmodic contraction. * * *

"It would, perhaps, be impossible to give any thing like *a system of rules* for the most proper and convenient make, size, weight, turn, &c. of a plough for all the varieties of soil, or of diversity to be met with, even in the same ridge; neither shall I make the attempt; but a few rules may be laid down, and observed as axioms in all ordinary circumstances, viz.

"1.—The horses should be yoked as near to the plough as possible, without too much confining, or preventing them from taking a free step.

"2.—When at work, they should be kept going at a good pace.

"3.—The chains or theets should, from where they are suspended over the backs of the horses, point in a direction leading through the muzzle, to the centre of the cutting surfaces of the coulter and share.

"4.—The implement, when taking the form of the dimensions required, should stand upright, and glide onwards in the line of progression, without swerving in any particular way.

"5.—The ploughman should walk with his body upright, and without using his force to one point, or showing appearance of inclination.

* * * * * * * *

"The untamed and liveliest, or most forward horse, should be put in the furrow, and only bound back to the right or off theet of the land-horse, at or near the place where the backband joins it, at such length, when stretched at the width required, as to prevent his end of the beam, or double tree, from being before the other. And further, the heads of the two should be connected together by a small rope or chain, at the distance wanted, giving the furrow-horse power over the other; that is to say, if tender-mouthed, it must be fixed well up on his head, and in the rings of the bit or curb of the other, so that he may have the power of the head over that of the mouth of the land-horse.

"A plough is made *to go deeper* in the following ways, viz.—By lowering the backbands, or increasing the distance of the horses; by putting the muzzle higher in the index of the beam; by slanting, or giving the coulter a greater rake forwards; by lengthening the sock, binding it down, or by carrying the stilts; and the reverse will make it go shallower. But of all the means, if the horses are of an ordinary size, (about 15 hands high,) I would only recommend the shifting of the backband and muzzle.* The coulter should always have a good rake forwards; and I would, without any exception, reprobate the setting of it upright, the undue lengthening of the sock, the carrying up of the stilts, or removing the horses, except on account of their extreme height.

"In regard to the lateral or side motions, the first thing to be noted is, that the plough stands upright—a requisite equally indispensable with that of bearing equally all along on a straight sole. The next is, that the edge of the coulter be set directly forward; at least, that the land side of it run on a parallel line with the land side of the head, and that there be no turning of it to the right or left, to cause the plough to take a broader or narrower furrow-slice—a method too frequently resorted to, without considering the bad effects, in point of resistance. Nor is this bias at all governable. It increases with the solidity, and diminishes with the looseness of the soil.

"There are many ways of making the plough *take a broader slice*, or giving her more land, as it is commonly called; but the only unobjectionable way is, that of making the horses go a little wider. It may be done by giving the furrow-horse the longest end of the main tree; but, consequently, the land-horse will bear more than an equal share of the draught. It may be done by hooking in, or drawing from the right side of the muzzle, which, to an inch or two from the centre, may be allowable, and in general may be most practicable; but, whenever carried to three or four inches, or more, is highly reprehensible, as the plough is made to go in a distorted, crooked gait, and forced on out of its natural line. It may be done, too, by setting the coulter more to the left; and this, if the edge stand as before directed, may be admissible to a small extent; but if carried far out, its land side, and the after part only of the plates, are made to bear all the strain or friction which should fall equally on the whole. It may also be made to take more land by turning the point of the sock to the left, as well as by carrying the feather suddenly out. The bad effects of both these practices have been mentioned in the preceding chapter. And, lastly, the ploughman has, to a certain extent, a discretionary power of giving breadth, by pressing the handles towards the right; but it soon becomes oppressive to keep any set of the muscles strung, nor is it in the power of nature to do so for any length of time.

"The contrary measures may be resorted to, *to give the plough less land*, and the same observations will reversely apply to any alterations on the beam, and muzzle, and inclination of the steersman."

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* This is sometimes called the nozzle.

POTATO.—This may be designated an herbaceous perennial, as it will grow from the tubers in the same place, year after year, and like other tuberous plants has a two-fold mode of propagation. But, except to obtain new varieties, multiplication from the seed is never resorted to; the propagation, in point of practice, being altogether from the tubers, which are either planted whole or divided.

Its early history has been given at some length by Mr. Robert C. M'Adam of Belfast, in an interesting essay read before the Belfast National Historical Society,* which we have here abridged.

In the beginning of the sixteenth century the *Spanish sweet potato*, (*Convolvulus*,) most probably introduced from the West Indies into Spain, was cultivated in the gardens of Europe under the Indian name of Battata. Old Gerard, the English herbalist, (who lived in 1590,) has given a full description of the plant, and, among many minute particulars regarding its nature, remarks, that

> "The potato roots are, among the Spaniards, Italians, and many other nations, common and ordinary meate; which, no doubt, are of mighty nourishing parts, and so strengthen and comfort nature; whose nutriment is as it were a mean, between flesh and fruit, though somewhat windy; but, being roasted in the embers, they do lose much of their windiness, especially being eaten sopped in wine. Of these roots may be made conserves, no less toothsome, wholesome, and daintie, than of the flesh of quinces. And likewise those comfortable and delicate meates called in shops morcelli, plancentulæ, and divers other such like. These roots may serve as a ground or foundation whereon the cunning confectioner or sugar-baker may worke and frame many comfortable delicate conserves and restorative sweetmeates. They are used to be eaten roasted in the ashes; some, when they be so roasted, infuse them and sop them in wine; and others, to give them the greater grace in eating, do boil them with prunes and eat them."

Falstaff says, in the Merry Wives of Windsor,

> "Let it rain potatoes, and hail kissing comfits."

Kissing comfits, as fashionable then as Morrison's pills are in the present day, were, according to Mr. M'Adam's researches, principally composed of potatoes.

Our potato, the *Solanum tuberosum*, according to the Spanish historians, was found by the Spaniards in Chili † and Peru, under the name of Papas. On their first arrival there, they brought the root to Spain, calling it Battata, from its resemblance to the sweet potato already known to them there. Some more modern travellers have found it in the neighbourhood of Valparaiso. It has been introduced by Mr. Caldclough to the garden of the London Horticultural Society, where it now is. When found in Chili, its native clime, the produce was bitter, but by culture it has become sweet as well as vigorous and productive, but the tubers are small. Varieties spring in profusion from its seed.

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* Quarterly Journal of Agriculture, No. 27.

† Mr. M'Adam states various reasons for supposing that this is the native country of the potato, and is supported by the opinion of Humboldt. The English colonists of Virginia probably procured the plant from South America.

The introduction of the potato into Ireland has been generally attributed to Sir Walter Raleigh, who is said to have brought it from Virginia in 1584.

The story is, that he directed his gardener to plant some sets at Youghal, in his garden; the plants flowered, and in September they produced their *apples*, which the disappointed gardener carried to his master, asking, "were these the fine American fruit?" Sir Walter having tasted them, desired him to dig up and throw the *weeds* away. On digging them up, the gardener was surprised to find about a bushel of tuberous roots; from these have probably been propagated all the potatoes in Great Britain and Ireland.

In the manuscript minutes of the Royal Society of London, December 13, 1693, it is recorded that the president, Sir Robert Southwell, informed the fellows that his grandfather first cultivated potatoes in Ireland, and that he had got them from Sir Walter Raleigh.

By the shipwreck of a vessel on the part of the coast of Lancashire called North Meols, they were introduced into England from Ireland, after they had long been cultivated in the latter country, and Lancashire is now superior to every other part of England in the culture of potatoes.

For a long time they were only grown in gardens, and considered a great delicacy. In the reign of James the First, they were sold at two shillings a pound; and it was not until the year 1663 that, in consequence of a strong recommendation of them by a Somersetshire gentleman, their cultivation was encouraged by the Royal Society. Their members who possessed lands were urged to plant them, and Evelyn was directed to treat of the subject in his "Sylva," published under the sanction of the society; but of so little estimation were potatoes in England, even a century after their introduction, that they were not noticed in some of the principal gardening books of the day, and this indifference was, doubtless, attributed to the ignorance which prevailed respecting the culture and mode of dressing them for the table. "A person who had been invited to taste the first potatoes planted in the county of Forfar, about the year 1730, related that the roots had been merely heated, and that they adhered to the teeth like glue, while their flavour was far from agreeable. The food was about to be condemned, through the ignorance of the cook, when the accidental arrival of a gentleman, who had tasted a potato in Lancashire, caused the rejected roots to be remanded back to the hot turf ashes, till they became as dainty as they had before been nauseous."

We have reason to know that boys in Aberdeenshire used to store them like apples or sweetmeats in their clothes-boxes at that period, and that they were an agreeable garden rarity.

Potatoes were first cultivated, according to statistical accounts of Scotland, in the county of Stirling, in the fields, in 1732, and in the general report of Scotland it is mentioned that—" in the year 1725-6, the few potato plants then existing in gardens about Edinburgh were left in the same spot of ground from year to year, as recommended by Evelyn ; a few tubers were perhaps removed for use in the autumn, and the parent plants well covered with litter, to save them from the winter's frost." Though the humbler classes of Scotch soon after this ascertained the excellence of the potato, it was not encouraged by the agricultural writers, nor cultivated among the higher order of farmers, many of whom, in the days of the puritans, were so fanatically absurd as to object to them as food for man, because they " are not mentioned in the Bible."

But the poverty of the Irish peasantry has done more for the extended culture of the potato than any other circumstance whatever. An article of food—and that nearly exclusive of every thing else—on which so many millions of men have multiplied in so extraordinary a degree, and fed and attained proverbial activity and strength of mind and body, cannot be unwholesome or unprofitable; and though many are of opinion, and with much foundation, in truth, that the *exclusive* use of the potato has injured the condition of Ireland, by calling into existence an overflowing and wretched peasantry which would otherwise have been only commensurate with the supply of grain, so superior in its quality, we cannot but think that the introduction of the potato must be considered, on the *whole*, as a blessing to us, for it will succeed on every soil, and in every situation, and in every part of the British Islands, though the amount of produce, and its quality, will be considerably influenced by the nature of the soil, and local agencies.

Within a very few years the proper culture of this root has made considerable progress, except perhaps where it is most needed, in the western and south-western parts of Ireland, where agriculture is still rude and defective among the cottagers and small farmers, who are so injudicious in their mode of culture, so careless in their selection and management of seed, so limited in their use of manure, and so little able or willing to bestow the careful and laborious treatment which the potato requires to render it fully productive, that it does not yield to the poor of those and *many other parts* of the kingdom, much more than half of what *might* be raised.

The practice until late years has been almost universally, to plant the cut sets, but since the failure of potato-crops, the seed, in numerous instances, has been left uncut.

This leads us to the consideration of the causes assigned for *the failure*, which must be noticed, although the subject is really a mystery, for no cause (and many have been very dogmatically urged) has been assigned which has not been met by a flat contradiction, or the assertion of an exactly opposite principle; for example—

One writer says—"the true cause is this—the digging of the potatoes in the preceding year, before they were ripe;" on the supposition (we conjecture) that if the growth of the plant be prematurely arrested or hurried through its latter stages, the bulb, having its pores filled with the juices of the plant, and destitute of farina, (which being insoluble in cold water, will enable the bulb to resist ordinary moisture,) will be disposed to decay if the season of sowing be wet. "All fudge!" replies some confident antagonist theorist, "the over-ripening of the potato is the cause of the failure of its growth, as well as of the curl, and all degeneracy."

This opinion can be in some degree fortified by the well-known fact that the seed* most valued for dry calcareous clay or loam, is that which is grown on mountain or bog-land, where the plants *are* arrested prematurely in their growth by the action of frost. In such situations, the potato-crop is planted later, and taken out earlier, than in the lowlands. The seed grown upon bog or moorland, though as wet as a sponge, has produced the most abundant crops, and of a dry and mealy quality too, on soil of a *different* composition; and though the careful Scotch farmer changes the seed of the potato frequently, it is remarkable that the grower on the moors and mosses continues to plant from his original stock without any change of seed. The nature of this potato, full of sap,† is so well understood by the Scotch, that the supplying of the lowlands with seed from the moorland farmer, has become a regular system, and to the advantage of both parties; the latter obtaining a much higher price for his watery seed, than is obtained for the most farinaceous potatoes in the market, and without even the trouble of conveying them thither, the purchaser of the seed being at the expense of cartage—sometimes to a very *considerable distance*.

The same practice prevails in Ireland; seed that has been grown on bogs—often planted so late as June, and the produce of which is dug out in October—is always preferred for soils of a different quality from that in which the stock was raised.

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* By seed is to be understood here, and generally throughout, (according to the familiar acceptation,) the tuber itself, whole, or cut into sets for propagation.

† Gardeners propagating tuberous plants, prefer them in a juicy state; and, in the case of the potato, there is no doubt of its germinating best when not fully ripe, but the difficulty of *preserving* potatoes in this state operates against the practice of taking them up whole, in a succulent state.

"Neither of the above opinions is worth any thing, as to the elucidation of the cause of the failure," says some other speculator; "I can assure you that it is entirely attributable to the deterioration of the soil. Potatoes have been so much cultivated latterly in Ireland and Scotland that the land is tired of them, and will yield them no more!" No doubt, if the *same* patch of land be cropped year after year with potatoes, that spot will at length grow weary of producing them, for the well-known reason, that the excrementitious matter of any plants becomes, in the course of time, more or less noxious to that *particular* plant, though plants of other species will not be in the least affected by it. The Irish cottier's garden is certainly an illustration of the truth of the degeneracy of the soil as to its power of producing potatoes for a long succession of years; the crops in such a case are very *scanty*, but the *decay of the seed* has not been more remarkable on such soils than elsewhere. The soil in this case may be so far renovated by deep trenching, and the exposure of fresh earth, as to produce potatoes after preceding crops of them, with a tolerable return, especially if a different variety of potato be substituted; but this case only procrastinates the deterioration, the failure will ultimately take place; a failure, however, of *produce*, not of the plant, as regards its mere growth.

The following statement, made to us by a highly scientific and practical gentleman,* is quite in point. Being limited in room, he planted the red apple potato, in the same piece of ground, during the years 1835–6–7. The crop was good in 1835; in 1836 only one-third of the preceding, (but the earlier part of the summer was hot and dry, and the aphis or smother-fly infected the crop for the remainder of the season;) and in 1837, the ground being trenched two spades deep, in order to its renovation, Mr. R—— planted it with the same sort raised on the same ground, carefully selecting the best potatoes for seed; these came up well, and produced what he would have deemed a tolerable crop, had he not planted a few drills with seed, (also of the apple kind, procured from fresh soil, not apparently equal to his own seed,) which, to his surprise, came up ten days or a fortnight earlier, maintained a superior vigour throughout the season, so striking that no one would suppose, at first sight, that it was the same sort, and at the season of digging out, the produce was one-third more; yet from some drills planted with both seeds, side by side, in a piece of fresh ground, the produce was equal. The culture of *all* was the same—in drills 2½ feet apart, and well manured *over* the sets.

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* John Robertson, Esq., Kilkenny.

The inference which Mr. Robertson draws is, that where a necessity exists for planting the same ground with potatoes successively, a change of seed is indispensable, but not altogether requisite with a change of soil, though such a change is to be urged as the safest practice. Seed which has been taken from a single crop may also retain the predisposition to decay, but common sense will point out the absurdity of using it.

But though Mr. Robertson's experiments in a remarkable manner prove that fresh land is the best for producing potatoes, and that the earth loses its power of yielding them repeatedly in *succession*, it does not by any means tend to demonstrate (what indeed would be contrary to all experience) that, when the ordinary rotations are observed, the soil will not now, as well as at any other period, produce potatoes in their regular course, though the less frequently perhaps that their *turn* comes the better.

But there is a third cause assigned for the failure of the seed—namely, the fermentation of the potatoes in pits, or from the contact of the set with fermenting matter in the drills. "We attribute the disease to the heating of the seed, and to that alone," say the Messrs. G. and F. Macdonald, in an essay of the Highland Society.

Gentlemen—How can fermentation take place in the pits unless accompanied by rottenness, which would be an unequivocal testimony that the seed was unfit for use, and how is it to be proved that the gases evolved by fermenting manure can injure the shoots of potato sets? Fermenting manure would rather stimulate by their warmth, and excite their growth by the aliment which their essential qualities—carbon and ammonia—unquestionably supply to plants. Why do not the gaseous exhalations from rank and fermenting hot-beds destroy the tender plants which are raised upon them?

Your hypothesis is disproved by a variety of facts. There have been many familiar instances of partial failure in drills with cut sets, which unquestionably exhibit no symptoms of having fermented in any stage, or under any condition.

"Is it not a fact that in Ireland, where potatoes continue to be planted with the spade in lazy-beds, in numerous instances the sets on one-half breadth of each bed which were covered in the fore part of the day succeeded, while those on the other half, left uncovered till the after part of the day, failed, the seed being the same, and laid down in rows across the bed at the same time? Is it not a fact that many poor cottiers, particularly in Ireland, did, in the spring of 1833, and the spring of 1834, purchase a bushel of potatoes each, for seed for their garden plots, that, on reaching their places of residence with these potatoes, they forthwith cut them into sets; that one-half or two-thirds of these sets were planted immediately after being cut; that the remaining one-half or one-third—too small a body surely to *heat*—remained unplanted for eight or ten days, owing to some cabbage-plant beds, or something of the kind, being in the way, and which required to be disposed of before the remainder of the sets could be planted; that, when planted, they entirely failed, while those put in when fresh cut, grew vigorously."*

This is unquestionably true, and easily accounted for, at least as regards the latter circumstances. The vegetative powers of the seed were in action, and in the interval which elapsed between cutting and planting the sets, that action was arrested by the drying or exhausting influence of the weather. In *late* planting, it is injurious to cut the seed long before planting, for in the advanced season the vegetation is rapid, and the shoot establishes itself so as to become in a short time independent of the set from which it emanated. But in early sowing, it may be useful to sear the wound, as the growing powers of the sets are for some time dormant, having then no vital energy to resist the decomposition which a cold wet season is apt to induce.

The conjecture of another theorist is, that the contact of fresh fermenting dung, with the seed in the drills, may occasion the decay; and that, consequently, if short, well-decomposed manure, had been used instead of the fermenting substance, or, if earth had been laid in contact with the sets, they would have pushed out freely. This speculator adds—"the coarse kind of potato, called cups, never fails, which I suppose is owing to their containing little saccharine matter, in consequence of which they are not easily acted on by the fermentation of the dung."† There are numerous instances to the contrary. Manure consisting of road-scrapings, ashes, and animal substances blended together, has been used, and yet the sets have failed in many instances; and as to the non-failure of *cups*, we have nearly all Ireland against you, *cups* being the kind in general cultivation. The cases of failure of this kind of potatoes are unhappily too notorious, though in Scotland they may have proved hardy enough to resist the dry rot. At the same time it is to be admitted that potatoes planted on well-rotted dung, with a due proportion of moisture, have succeeded in dry and hot spring seasons, when those planted with dry unfermented dung have failed.‡

Manuring with sea-tang§ has been stated as a cause of the failure; the experience of all farmers on the sea-coast, from the time that the

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[*] Quarterly Journal of Agriculture, No. 31.

[†] Ibidem, No. 27.

[‡] Sir H. Davy's opinion that dung should be ploughed into the soil, and combined with it a considerable time before cropping, is unquestionably confirmed by facts as regards potatoes in dry spring weather, when the dung is *fresh*, "in order that the fermentation, and consequent absorbing of moisture in the soil, proceed at a season when the supply of moisture is abundant, and that the seed may not be exposed to the weakening influence to which such action would subject it."—*Report to the Highland Society on the Failure of the Potato Crop. Quarterly Journal of Agriculture*, No. 36.

[§] The sea-weed which grows upon *rocks*, whether for kelp or manure.

culture of potatoes has been first practised in the British Islands, warrants us in decidedly rejecting this hypothesis also; even admitting the effects of sea-weed of any kind to be injurious, (which we deny altogether, as regards the mere vegetation and productiveness of the potato,) these effects would be confined to the vicinity of the coast.

It has been conjectured by Mr. Breakenbridge, that potatoes grown on certain flat boggy land in Argyleshire, and manured with sea-tang, have failed to grow in Lancashire in consequence of their sickly quality, (this induced by sea-tang!) which rendered them unable to resist fermentation and its consequences, when closely packed in sea-boats. But to this is replied by the factor of the Duke of Argyle, that the lowlands referred to by the other were not of bog composition, nor flooded for ten years preceding, and that the farmers there had an experience of forty years for holding their high opinion of sea-tang as a manure.

Mr. Breakenbridge must know little of the value and use of sea-weed.

But the Liverpool Agricultural Society has completely disproved this opinion of Mr. Breakenbridge, as far as it has connexion with the importation of potatoes from Argyleshire to Lancashire for seed: "They find, in a considerable part of the district within the limits of the society, that the farmers use *no imported seed potatoes;* they procure what they want from their own neighbours, or use their own, giving a preference to such as grow on land *of a different quality* to that on which they intend to plant, and they find no evil consequences to result from the practice, neither have they the curl amongst their potatoes."

Fermentation of the seed in any way, and from any cause, is doubtless injurious, and, if excessive, fatal to the vegetation of the potato; but, when the set is *planted*, no injurious fermentation can take place. If potatoes are heaped up in a house at the time of their incipient germination, fermentation may no doubt injure the germs; or in pits, by promoting wasteful germination; but when the set is *planted*, no injurious fermentation can occur.

But how does it happen that this fermentation, if it has really taken place in the various supposed cases, did not take place in former years?*

But what was *that* which enabled the potato to escape decay, piled in pits or houses, and in great masses too, long before the appearance of the general failure? What was *that* which enabled the cut set to escape failure then, though it is subject to it now?

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* We got out our potatoes (cups) last winter, in dry weather, and put them into narrow pits in a perfectly dry state; some were dug out from the drills while the plough was otherwise employed, and a few of these were cut by the spades. Every one of these wounded potatoes was found at Christmas to be destroyed by a dry rot, though the whole potatoes were perfectly sound and dry. There were no symptoms whatever of fermentation. In former years (previously to the period of failure) these cut sets would have been perhaps sound as the rest.

What was *that* which made the cultivator then disregard the state of the manure when applied? What was that which enabled the sets to escape with life in 1836,* (a year of remarkable drought,) and yet perish by milder droughts of the last three years? What is that which enabled the potato to defy failure when the land was constantly over-cropped and *under-manured?*

Precautions are now necessary; what is *that*† which enabled the cultivator formerly to disregard them? The conjecture of an able writer,‡ whom we here partially quote, (and he does not stand alone in his opinion,) is, that the potato has lost its constitutional vigour; that from age and debility it has been deprived of the power of resisting those influences which in its earlier and more vigorous days were innoxious. He therefore passes by all particular consideration of the *secondary* causes of the failure, and refers to a single principle—that of constitutional weakness, superinduced by a peculiarity of treatment—for the solution of the mystery.

He asks, "why should a change be thought incredible or anomalous in the potato, when varieties of plants, and even animals, treated in a peculiar manner, are liable to constitutional decay?" And he instances various species of fruit which have disappeared or declined, on account of their constitutional weakness. He traces this degeneracy or debility in the vegetable, as in the animal kingdom, to too near an approach to consanguinity.

Circumstances refute this, at least as far as the limit of forty or fifty years.

Mr. Robertson's apple potatoes at this day are from a stock which he obtained in 1800 from Mr. Boyse, the proprietor of Bannow, in the county of Wexford, and then resident in the county of Kilkenny. He has never changed his seed since, and they are now in their original vigour, though at one period they degenerated from being repeatedly sown in the same land. Since he took the precaution of shifting them alternately each season, from one piece of land to another of a different quality, they have regained their pristine vigour, and produce at the rate of 180 barrels to the Irish acre, an immense crop for the apple potato, which is not in general an abundant bearer.

This species of potato has been in existence, to a certainty, between forty and fifty years, perhaps longer. Sir Alexander Glibson, of Clifton Hall, Edinburghshire, and his father, for sixty-five years planted the same species of potatoes. There are numerous instances of the same kind of potatoes having been propagated without deterioration by the same individuals for many years. According to Mr. Aitkin, and his reviewer, this curious and remarkable distinction is at the same time to be kept in view, that varieties in the vegetable world, obtained by grafting, budding, cuttings, tubers, &c. degenerate after a lapse of time, but that plants which can only be raised directly from the seed, do not indicate weakness. The varieties of grain, for example, are as healthy as when originally obtained, and will endure every sort of treatment. The varieties of these kinds of plants have been obtained by impregnation of the seed, and as they can only be reproduced from the seed, they will remain permanent.

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* Cases in point are given in the work last referred to.

† See a remarkably able review of Mr. Aitkin's highly-finished pamphlet on the diseases of the potato; &c. &c.

‡ The reviewer of Mr. Aitkin's highly-finished essay on the Diseases, &c. of the Potato.—*Quarterly Journal of Agriculture, No.* 37.

A variety of fruit propagated by grafting, through ever so many generations, is but an extension of the original seedling, which dates its age from the *seed*, and though its period of existence, by grafting on young stocks, be prolonged, it is not regenerated, and will at length decline, but not step by step with the original plant. Yet the analogy is not maintained between it and plants reproduced by *seed*, one generation of which is not only of equal vigour with the former, but if cultivated with judgment may be moulded to the wants or wishes of the cultivator.

But plants like the potato, which may be raised both from seed, tubers, cuttings, &c. will, according to this writer, if raised by the second method, indicate weakness, and the more numerous the modes of propagation, the more easily do the plants fall into decay. *If* a new species of potatoes could be obtained from the supposed parent stock in South America, (but what a period would elapse before we could have a sufficient supply from this?) its vigour might be long maintained.

The same writer presses upon the attention of the farmer the propriety of raising new varieties, until excellence in the kind is obtained, which certainly is more judicious, and infinitely more practical, than the alternative of sending a botanist to Peru or Chili in quest of the indigenous root, which is very small and bitter; besides, every plant cultivated from seed is as original and perfect by nature as that which grows wild, and perhaps more so if the latter has been propagated by other means than that of seed.

We have been somewhat diffuse on this latter point, from a high respect for the authority whence the foregoing information is derived; but our opinion—if we may presume to hazard one—is, that none of the causes assigned are satisfactory; and, of course, that this last hypothesis is without foundation also.

The fact of degeneracy has been by no means satisfactorily proved. This much seems certain, that the potato planted late in peculiar seasons, long after it has commenced germination, and if long uncut, will be subject to decay; and the longer it is kept out of the ground under such circumstances, the more will the chances of decay multiply.

Atmospheric influence is more probably the *primary* cause. The failures are now much less frequent; and it may be that the existing cause has for the present passed* away also; the advance, the progress, and the cessation of cholera has been very similar, and we think from certain combinations connected with the atmosphere; but who can say positively that such is the fact?—the matter is still a mystery.

Mr. Aitkin suggests for testing the vitality of seed, that a dozen or two of those intended for planting should be cut and laid in a dry house with the skin next the door: "if upon examining them three or four days afterwards it will be found that the incision has dried up, and been covered with a kind of new skin, be assured that the seed is wholesome—plant it; but if, on the contrary, the wound is found to be wet, sluggish, and spotted, touch not the unclean thing, but be certain that the constitution of the potato is exhausted. This experiment should not be tried until vegetation has completely taken place—say about the middle of April."† This is correct, particularly if *cut* sets are to be used. The fact would *seem* to be, that the immediate cause of failure in the set is the diseased state of *the germ*, be the remote cause what it may, and that seasonable care will prevent it.

By attending carefully to the seed-stock, by opening, turning, and airing it, and spreading it thin on the floor, the failure from dry rot or curl may be guarded against (though in the ulterior progress of vegetation, injury from various atmospheric causes may arise); by taking these precautions on the first appearance of germination, (a critical moment,) which can be easily done—especially on a small scale of farming—disease of the *seed* may be totally prevented. But the longer the planting is postponed, the more are the chances of failure multiplied. The injudicious treatment of seed, combined with late planting, necessarily occasions the exhaustion and debility of the vegetating powers in the embryo bud.

When seed is deposited in a warm house, or in a close pit in mild weather, and kept too long, the pabulum stored for the food of the germ is wasted in the production of useless shoots, or the germ is enfeebled by the exclusion of the vital air indispensable to stimulate its dormant powers; these, while the temperature is low, do not require the nourishment contained within the tuber; but when the supply becomes necessary, it, perhaps, cannot be commanded in consequence of premature exhaustion.

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* Since the commencement of this publication we have seen in the present season several instances of failure of *cut* sets.

† Quarterly Journal of Agriculture, No. 37.

Scattering powdered lime over the seed is also a good preventive against decomposition, if potatoes have been closely confined and disposed to heat. The lime probably acts beneficially by preventing the escape of the inward sap—possibly by the destruction of animalcula, though the existence of these in an unusual degree would be the effect and not the cause of the rot; and therefore their destruction would be insufficient, one would suppose, to arrest the progress of the disease. *Limewater* may act efficaciously by imparting necessary moisture.

THE MOST APPROVED VARIETIES.—It is no easy matter to point these out. Some conception of their numbers can be formed from the fact, that Mr. Lawson, curator to the Highland Society, exhibited no fewer than 1600 kinds in 1837. Every grain of seed will produce a variety. Experimentalists probably never meet two exactly alike; they sport into infinite varieties without hybridizing, although carefully saved and sorted.

The mode of raising by seed is as follows: dry the apple, rub out the seed, preserve it from damp or mould until the end of March or the beginning of April; then sow it in pans with a covering of earth a quarter or half an inch in thickness; and place the pans in a mild hot-bed, such as is fit for half-hardy annuals. When the plants are about an inch high, prick them out two inches apart in other pots; nurse them in the same heat, or rather in a cooler degree, to harden them gradually until all danger of frost is over, when they may be planted out, to remain in rows eighteen inches distant, and six inches apart in the rows.

Tubers two inches in diameter have been obtained at the end of the season in this way, and their quality has been then nearly ascertained.

In the following season plant the tubers out at the ordinary distance.

Last year Mr. Robertson raised a number of seedlings from the red apple and a red-nosed kidney; and scarcely any bear a close resemblance to the parents. It would be desirable to hybridize scientifically, and not to leave the varieties to mere chance.

We shall only name those which are in common culture in the united empire.

Early Kinds.—Ash-leaved, Early Manly, Early Champion, Early pink-eye, Wicklow Bangors, Taylor's forty-fold, Chinese lady, Fox's seedling.

Middle Season.—Early Shaw, Scotch pink-eye, White kidney, Red ditto, Red-nose ditto, Blue-nose ditto, Salmon ditto, Cumberland.

Late Kind.—Old apple, Red apple, Cups, Blacks, Lumpers.

The cup is one of the most mealy varieties. The Irish prefer it to all other kinds from its formerly reported hardihood, and what they term its *strength*. Next to this, the poor man cherishes the white lumper, which grows freely with little manure. It has so far improved by age as to be now a good keeping potato.

MODE OF CULTURE.—The lazy-bed system is so completely condemned by all good farmers, except on ley, or in undrained moors, that it shall not be detailed at any length.

In bogs and mountains where the plough cannot penetrate through stony soil, beds are the most convenient to the petty farmer, who digs the sod with his long, narrow spade, and either lays the sets on the inverted sod, the manure being previously spread on it, covering them from the furrows by the shovel; or, as in parts of Connaught and Munster, he stabs the ground with his *loy*,* jerks a cut set into the fissure when he draws out the tool, and afterwards closes them with the back of the same implement, covering the surface, as in the other cases of lazy-beds, from the furrows. The general Irish mode of culture on old, rich, arable ley, (a practice very common in the county of Clare, and elsewhere among the peasantry who pay dearly for old grass-land,) is to plough the field in ridges, to level them perfectly with the spade, then to lay the potato-sets upon the surface, and to cover them with or without manure by the inverted sods from the furrows. The potatoes are afterwards earthed once or twice with whatever mould can be obtained from the furrows by means of spade and shovel.

In wet bog-land, ridges and furrows are the safest, as the furrow acts as a complete drain for the surface-water; but wherever drilling is practicable, it is decidedly preferable, the produce being greater in drills than in what may be termed, comparatively, a broad-cast method. For very early potatoes, such as the ash-leaved kidney, the drills (which should range north and south) need not be more than two feet apart, and, according to the practice of the late Mr. Knight,† a most scientific and successful cultivator of potatoes, the seed should be whole, as in all other cases; and the largest of the kind placed at four inches distant in the rows, with the crown end uppermost. Mr. Tower's practice with the *very early* kinds, is to plant the sets in trenches about eight inches deep and a foot wide—the excavated earth forming an intervening ridge. Into these trenches he digs three or four inches of half-rotted stable-dung, with leaves used for linings, and rakes in as much earth as will fill the trench to within four inches of the surface; he gives only one inch of cover at first, but adds occasionally half an inch of sifted ashes; and he protects the shoots as they are coming up, from frost by dry litter.

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* A long, narrow spade peculiar to the labourers of Connaught.

† President of the London Horticultural Society.

But it is with the main crop that the details of management are most necessary.

After the deepest possible ploughing* (but without disturbing the substratum) and good furrowing in the preceding autumn or winter, the land should lie undisturbed until March, when it should be harrowed down sufficiently to allow the horses to cross-plough it. In April, unless the land be of so friable a texture as to be fit for planting without it, another harrowing and ploughing should be given; for, on the *perfect looseness* of the earth will greatly depend the success of the crop.

In proof of the advantage of complete pulverization we may cite an experiment of Mr. Lyster, of Thurles, in the county of Tipperary. In the year 1836, after planting and managing three acres of potatoes in the usual way, he employed men at the proper time for earthing, to *dig* between the rows, and as deeply and finely as possible, from plant to plant, throwing up at the same time with the spade two or three inches of earth to keep the plants steady. The result was, that he had about 190 barrels (20 stone each) to the plantation acre. At the same time he planted half an acre, treated for the sake of experiment, in the ordinary way, moulded with the plough, &c., and had only at the rate of 100 brls. per acre in return. The extra cost of labour was 40s. per acre. But he had another counterbalancing advantage from digging well and deeply—three barrels more of wheat than from the part tilled with the plough in the common way. It must, however, be stated, that the same favourable result did not attend the repetition of this practice in the last year, owing, it is supposed, to the great moisture of the season. The plant deriving in consequence a greater proportion of its aliment from the atmosphere, needed not, as in the former year, to penetrate the great depth of land prepared for the ramification of the fibres, if so disposed; yet even in this case, the advantage was sufficient to repay the extra cost. Such and so varied are the circumstances which must combine for the successful culture of vegetables. To lay down general rules is therefore often as unwise as difficult. The result of an isolated experiment should not decide any doubtful question, which can be only satisfactorily solved by the results of a long series of trials.

When the season for sowing arrives, the manure should be carted out in rows about twenty-one feet apart, and in such quantity as will allow the spreaders to fork it into eight or ten drills, that is, into four or five at each side of the row, with perfect convenience. The next step is to form the drills, which should be from two-and-a-half feet to three feet apart, according to the quality of the potato and the probable luxuriancy of the stalks. Mr. Knight's rule on this point is, that the intervals between the drills should bear a certain ratio to the estimated height of the stems; "the height of the stems being three feet, the rows ought to be four feet apart." Whatever is lost by the distances is, in truth, more than made up by the increased luxuriance and the advantage obtained by allowing horizontal extension to the fibres. But as a general rule, two and a half feet is, perhaps, the best distance for the ordinary kinds of winter potatoes, it being by no means desirable that the foliage should become too rank or the stalks too high; for in this case, "the tubers, though large in size,* numerous, and weighty, are poor in quality, deficient in *amylum*, (*starch*,) and frequently hollow." If there be reason for apprehending too much rankness of vegetation, the remedy is simple enough—limit the allowance of manure.†

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* We recommend four horses to the plough in a deep, stiff soil.

SEED.—Select the best-shaped potatoes, of a middling size, whether they are to be cut or not; and if there be ground for supposing that they have heated in the pit, the safest mode will be to choose those which are near the outside; for even if fermentation have taken place in the centre, those will not have been affected by it. In all cases when the buds push, the seed should be selected and kept thin, and retarded in their germination by every means until the time of planting, which should not be deferred, except in the very northern parts of our climate, later than the middle of April, under ordinary circumstances. May, however, seems in many districts to be the favourite month with farmers, although they must perceive that the seed has been wasting its powers long before.

Here the point is to be discussed, whether whole or cut sets are preferable; and towards the decision of the question we have at hand the details of an experiment made upon this subject by our valued correspondent, Mr. Robertson, already alluded to.

No. 1. Two drills, with sets (red apple) of two and three eyes each, nine inches apart—produce, eighty-three pounds.

No. 2. Two drills, with sets, twelve inches apart—produce, seventy-seven pounds.

No. 3. Two drills, with sets, sixteen inches apart—produce, seventy-one pounds.

No. 4. Two drills, with sets, whole potatoes, nine inches apart—produce, eighty and a half pounds.

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* Not, however, if they have a proportional distance—in this case, they will neither draw weak nor be inferior in quality.

† Mr. Towers on the culture of the potato.—*Quarterly Journal of Agriculture, No.* 43.

No. 5. Two drills, with sets, whole potatoes, sixteen inches apart—produce, eighty-six pounds.

This gives a decided superiority of produce to whole potatoes at sixteen inches apart, (which will not occasion a much greater expenditure of seed,) than to large cut sets, with three* eyes, planted at nine inches apart—the ordinary distance; besides the saving of labour in cutting, and the probable security of the crop from failure in consequence of the dry rot in the seed.

We ourselves have this season accidentally experienced the benefit of using uncut seed. We planted cut sets of apparent excellence in some drills; and being hard run for seed, we used for some contiguous drills, (of precisely similar soil, and with dung from the same heap,) the *refuse* of our potatoes, not larger than walnuts. These have grown *luxuriantly*, and without a single failure; while the cut seed *failed* altogether in numerous instances, and in no case pushed forth such vigorous stems as those which proceeded from the whole potatoes.

But we have another experiment, still more strongly in favour of whole sets.

No.	Different sorts of Sets planted 17th May, 1833.	No. planted.	No. that grew.	Appearance of top.	No. fit for table.	No. of small.	Total No.	Gross weight
								lbs.
1	Large whole Potatoes	8	All	Veryfine	56	35	91	18
2	Large whole Potatoes prepared by scooping a piece out an inch deep and an inch in diameter	8	All	do.	55	32	87	16
3	Small whole potatoes	8	All	small spiral	18	21	39	4
4	Sets with a single eye cut in the usual way	8	All	do.	22	5	27	4¼
5	A crown eye cut circular and conical, and about ¾ inch diameter at the base or eye	8	All	fair size	27	10	37	5½
6	A side eye cut as last	8	7	do.	18	8	26	3¾
7	Rind with two eyes ½ inch thick . .	8	7	small	12	10	22	2¼
8	Sets with the eye cut in half	8	All	do.	20	6	26	3¼
9	Large Potatoes with the rind not peeled off, but all the eyes scooped out about half an inch deep	8	4	fair size	19	24	43	4
10	Large Potatoes peeled about ¼ inch thick all over	8	4	small	9	11	20	2
11	Budded Potatoes	6	All	small	none	—	—	—

"The produce of No. 11 was very small, and a mixture of white and red according as the bud or stock grew; so that it would appear no variety can be gained from budding. The seed is the only source from whence varieties can be obtained, being inoculated by bees, &c.

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* The chief use of having two spare eyes is to guard against the possible loss of one or more by frost or any accident which might destroy the first shoot. Instances have been known of the first shoots having been destroyed by frost in a single night; after a *short* time the second eyes pushed upwards and prevented the loss of the crop. If the seed be cut, let it be soon set.

"GENERAL OBSERVATIONS.—The sort on which this experiment was tried was the Devonshire red rough. The sets, &c., were planted on the 17th May, 1833, in rows twenty inches asunder, and ten inches distant, each sort occupying a space of six feet eight inches; dressed with rotten dung, and earthed up twice. The crop was dug on the 12th November, 1833, and the best looking samples were Nos. 2 and 5."*

In the above experiments the distances were in all cases ten inches, which, though the cut sets were (compared with large potatoes) placed at disadvantage for fair proof of produce, the experiment is, in all particulars, quite fair as affects the question at issue, between large, whole potatoes, and sets with a single eye cut in any way†—small potatoes, if evenly planted within five inches of each other, would not, it appears, have produced one half of what the large, whole potatoes yielded.

If, however, the distances between the drills exceed three feet, we would recommend that the whole potatoes should be planted closer, but doubt the economy of placing them according to Mr. Knight's practice (supposing the drills three and a half or four feet apart) at only six inches distance, if they weigh "from a quarter to half a pound."

When the drills are formed, the setters, at regular distances from each other in the drills with the seed in stout aprons, lay down the sets at the prescribed distances, walking smartly backwards, and a sufficient number of men, at fixed distances also, lay the manure *over* the seed; and if it be long, half-fermented dung, they should press it down on the seed, in order to have it perfectly covered by the plough; the furrows being swept by going down and up the first furrow, down the second, up the first, (the third turn,) down the third, up the second, (which finishes without leaving a track of the horses,) down the fourth, up the third, and so on, care being taken not to put more than an inch and a half of covering, unless in sandy soils. The concluding operation is to roll the drills flat, which will close the mould, over the seed, and allow it an even and free surface for the rising stems.

When these are about seven inches high, the paring plough, which a single horse can easily draw, should be set to work to remove the earth from them, passing as close to them, and sinking as deep as may be without injury to the fibres. The weeders then take the hoe, or their fingers, and clean out the weeds from the line of plants, and the scuffler, (See *Plough*,) or *drill-harrow*, frees the intervals from all weeds, and levels the surface, preparatory to the introduction of the double mould-board plough, which should be used as *soon as possible* after stripping the potatoes, lest the tender and exposed stems or fibres should receive injury from the weather, or the sets be attacked by crows, which are very mischievous to the young shoots.

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* From Harrison's Gardener's and Forester's Record.

† It is, however, but fair to state, that Mr. Towers—no mean authority—who selected potatoes of four ounces, and planted them whole for three years, abandoned the practice from finding that the produce "did not correspond with the great bulk of tubers planted. The increase was only six-fold." If eight pounds were set in a row five yards long, the crop produced would weigh forty-eight pounds; from this it would appear that he planted the potatoes at six inches asunder. Had he planted them at sixteen inches, the return would probably have been as great, and then the case would have been materially different.

The process of earthing up is by some farmers repeated until the luxuriance of the stalks obstructs the passage of the plough; but it is *doubtful* whether this moulding be necessary in most cases, and almost certain that it is injurious, if the operation be repeated, in dry and shallow soils.

Another experiment of Mr. Robertson proves this.

His object was, to ascertain whether potatoes in drills derived any benefit from earthing—a matter which he considered very problematical. In an average portion of his potato-field—poor gravelly soil—he marked off four drills, each twenty yards in length, in two of which he planted red-nosed kidneys, and in the others red apple potatoes. These drills were earthed up in the usual manner, and produced ten per cent. less than four corresponding drills of similar potatoes unearthed. The drills in both cases were critically alike—two feet and a half apart; the sets were laid at distances of ten or twelve inches. The drills which were not moulded were treated in the following manner: they were dug twelve inches deep, but left half full by the spade. The sets were laid in them, and covered with dung about three inches thick, and over this was thrown a covering of about an inch of fine mould; when the shoots were sufficiently high, the clods, taken up by the spade, were broken about them, and drawn close about the stems; the intervals were dug deep,* and perfectly pulverized, and left quite flat; no other tillage was given. The produce was at the rate of 150 barrels per acre, and as has been already stated, ten per cent. more than in the earthed-up drills.

It appears that the same conjecture as to the utility of earthing potatoes, under particular circumstances, induced a French agriculturist to make a similar experiment four years ago. It is detailed in a well known French† work, and thus given in English by a writer in the Quarterly Journal of Agriculture:‡—

"M. de Dombale, a celebrated French agriculturist, says that he had uniformly believed and practised, and inculcated in his writings, the necessity and advantage of *earthing up the rows of potatoes* after being horse-hoed. Several circumstances, however, having given rise to doubts in his mind on the subject, he was determined to bring it to the test of experiment. Eight rows of potatoes were horse-hoed. Some little time afterwards they were earthed up, and when five inches high, they were again earthed up. Other eight rows in the same place, and under exactly the same circumstances, were *only horse-hoed* at the same time with the others, but received no earthing up, or subsequent culture. The rows that were earthed up *looked* more vigorous and thriving; but on taking up the crop, they weighed only 611 kilogrammes, (about 1222lbs.) whereas the eight rows that were *not earthed up*, produced 704 Kilogrammes, (about 1408lbs.;) and in a very fertile spot; the difference bears one-third (this would raise the produce of the eight rows to upwards of 1600lbs.) in favour of those that had not been earthed up."

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* Mr. Robertson has traced the fibres to the depth of four feet in *trenched ground.*

† *Journal* des connaissances usuelles et pratiques.

‡ No. 41, p. 78.

We believe that the system of culture which produces the greatest stalks will occasion the greatest bulk of potatoes, (supposing, however, the stalks and foliage to have proportionate room,) according to the theory of Mr. Knight and Mr. Towers, who considers that it is not by the fibres that the tuber is *immediately* nourished, but by the digested sap, when returned after having undergone new combinations by its exposure to light and air. The fibres are, however, mainly, though not directly, instrumental in affording nutriment to the tuber; in ramifying, through the soil, they extract from it aliment which they convey through the stalks, and which in the latter case is secreted in the tuber. But the theory of Mr. Knight should be given more explicitly. It is this—

The plant and its foliage are nourished by the ascending crude sap; but the tubers (not the plant) are supplied by the more elaborate or concocted descending sap, which in some degree resembling the blood in circulation, passes through the vessels on the upper surface of the leaf, and returns through those in the under one, descending by those in the exterior of the back, towards the root, and (after having been modified by the heat, and light, and air) supply the nutriment of the tuber, which derives its principal nourishment through that channel, and little or none *immediately* from the soil. Hence, the necessity of affording sufficient light and air to the leaves and stem of the plant for that purpose, and to this circumstance we must attribute the superior produce of drill crops.

On this reasoning Mr. Knight grounds the necessity of allowing room in proportion to the weight of the plant.

Be this as it may, we coincide with Mr. Robertson in his conclusion, that—

"Earthing is injurious in dry shallow ground, by rendering the staple between the drills more shallow and penetrable by drought, and by transferring it to a sharp ridge which cannot retain the moisture, but throws it off; on the contrary, in a soil where there is a redundancy of moisture, excavating the earth between serves to drain the drills, and the ridge being retentive of it, affords a sufficient supply to the fibres of the plant."*

Ought not the nature of the species also, in some degree, to regulate the practice of earthing? Those kinds, for instance, which tend upwards in the soil, may require earthing to invigorate them, when those which tend downwards require no such covering; and in exposed situations, where strong winds would be injurious to the stalks, heavy earthing must be necessary, though in low and sheltered fields it would be quite needless for mere protection against the effects of storm; but in all cases an earthing of three or four inches is indispensable to steady the plant against agitation from wind, and in proportion to the tendency of the plant to spread horizontally in its growth, the more will it require earthing.

The mode of applying the dung to the potatoes is another disputable point.

Mr. Knight is favourable to the thorough incorporation of the dung with the soil before planting; but it is generally considered better to apply the manure at the time of planting, to assist and nourish the young shoot in its earliest stages. Mr. Robertson has ascertained that the produce is greater and the maturity more advanced by this treatment; but so important is it to have the earth perfectly loose, that we unhesitatingly recommend the ploughing in of those compost manures which require much carting (and consequently cause much trampling and hardening) before the drills are opened, in *clay soil*, for the superior state of pulverization in this case more than counterbalances any advantages which would arise from placing the manure in contact with the potato-sets, while the ground was left in a hard and consolidated mass. But except under circumstances requiring such particular management, it is unquestionably better to have the dung in contact with the seed which it nourishes when in its most feeble state, and helps forward in its growth. When the manure is intermixed with the soil, the fibres in many cases will not extract the nutriment until late in the season, and then the dung promotes but an imperfect produce, the plant having been previously stunted by the want of it at the most critical stage of its growth.

BLOSSOMING.—When potatoes blossom too luxuriantly, some theorists strip off the flower, and they are probably correct in principle; whether the advantage will counterbalance the expense is another consideration, which we are not prepared to discuss.

PLOUGHING OR DIGGING OUT.—When the land is *dry*, the most expeditious and least wasteful mode of taking up the crop, (which should be as soon as possible after it is ripe, about the end of October or middle of November,) is by the plough, as follows:

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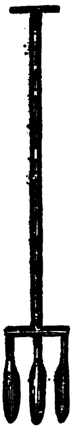
* Irish Farmer's Magazine, No. 16.



The headlands, if bearing potatoes, being first cleared, ten labourers are set to pull up the stalks, which are to be carted off to the farm-yard, and as many pickers follow, gathering up in baskets whatever potatoes are brought to the surface or attached to the stems. These should be taken to one of three carts placed at convenient distances, and drawn off to the pits; a double mouldboard plough, with an extremely long and narrow sole, and without the coulter, is then to be worked by a pair of stout horses in the centre of each drill, the sole passing about two inches below the level of the tubers, and the mouldboards splitting the ridge open and exposing the potatoes which are to be forked up by prongs, as represented in the plate,* in the hands of the men, while the pickers gather and place them in the carts. By this management the horses and twenty work-people (exclusive of men at the pits) are kept so busily employed that they may clear out an acre in the day. The horses should, at the close of each day, lightly harrow the ploughed and picked ground, in order to bring to the surface any straggling potatoes which may have escaped attention in the prior process.

Where a double mouldboard plough is not at hand, a common plough acts sufficiently well, by taking off a slice from each side of the drill before the centre is ploughed or pronged out; but this evidently requires two or three times the horse-labour necessary with the other plough.

In wet seasons the introduction of the plough may be impracticable, and digging unavoidable. In this very objectionable and tedious process, great care should be taken not to cut the tubers with the spades, as the wounded potatoes are especially apt to take the dry rot.

Pitting.—Great care should be taken to prevent any wetness from lodging at the bottom of the pit,† which is to be sunk about a foot, of any length, and about four feet in width. Mr. Aitken recommends layers of perfectly dry earth*, four or five inches deep, and of potatoes of the same thickness, alternately, with a gently rounded, not a sharp ridge, (which appears a very unimportant distinction.) A little drain should be dug round the heap, with an outlet for water to run off at a lower level.

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* "The flattened portion of each prong is about five inches in length, by one in breadth, thinner at each edge than in the middle, and with spaces of an inch between each prong. They are made of scrap or Swedish iron. (Occasionally I make them entirely of steel, in which case they are very light and handy, and wear much longer than when made of iron.) They are made with a prong to go into a handle of about four feet in length, and are found much more convenient for digging potatoes, and also for pointing borders in a garden, than any spade."

† The term pit is universally used, and yet very incorrectly, as there is in fact little or no *sinking* below the natural level of the contiguous land—the heap *raised* some feet above the surface.

It is certain that if there were no danger of *frost*, the best way of treating potatoes designed for seed, is to leave them during the whole winter, and until wanted for use, in the beds in which they grew. Mr. A. condemns the use of straw† altogether at top, between the potatoes, as it tends to keep in the heat. The outside covering of earth should be about eight inches thick. The dry earth, instead of promoting premature growth in the potatoes, probably checks it. They certainly bud very freely under ordinary management in mild winters, when in close contact with each other.

The *curl* is the only marked disease (besides the mysterious dry rot) to which the potato is liable, and this for a long time perplexed the scientific. It is said to have appeared first in 1764 in Lancashire, and in ten years after to have been very general, and countless philosophical essays were then written upon the causes of it, which only mystified the subject, and were as vague and contradictory as the recent speculative publications on the dry rot.

"It is a distorted or incomplete formation," probably proceeding from the inability of the tuber to afford an adequate supply of nourishment to the young shoot. The same peculiarities of season, and the same mismanagement of the seed, which have latterly occasioned the dry rot, may have at other periods produced the curl.

When the energy of the seed has been impaired from any causes, the exposure of the sets to the sun or dry air has produced the curl; the same causes which predispose to the one, tend to the development of the other. If there is only a partial manifestation of curl, it will be judicious to root out those plants in which it is distinguishable; if they are among those which are designed for seed, the tubers of the infected stalks are decidedly unfit for propagation.

It is remarkable that the produce of potatoes dug before they are ripe is rarely affected by this disease, while the over-ripe and farinaceous potatoes are subject to it.

The starch of the potato—for the term farina is scarcely correct, as it is deficient in the *gluten* which flour possesses—is an excellent substitute for arrow-root or tapioca, and with sugar or salt is admirably suited to the nourishment of the young children of the poor, and to the stomachs of persons of debilitated digestive organs. In winter, when milk is scarce, it is truly valuable, yet little used; when wheat is dear and potatoes are cheap in comparison, a thrifty house-keeper will find it good economy to grate the potatoes after a perfect cleansing, and extract the starch either for cakes and puddings, or for the laundress.

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* The earth interior of an old bank, indisposed to promote vegetation from its exclusion from air, would be the very best earthy admixture; but sand or ashes would be equally desirable.

† The use of potato stalks as a covering is very injurious; these soon becom mouldy and rotten, and their fermentation must hurt the contiguous potatoes.

Mr. R. Pooler, secretary to the Agricultural and Horticultural Societies of Ireland, has communicated to the editors of the Irish Farmer's Magazine, an interesting statement relative to the manufacture,* and invented a machine, of which is subjoined an extract, with a plate of the machinery.

"It is well known that the value of the potato consists in the quantity of meal or farina which it contains, and that all its nutritious properties are centered in this portion of the plant alone. Those tubers which contain it in inferior degree are neither pleasant nor wholesome.

"For at least a month or six weeks previous to the coming in of the new potatoes, only a few varieties are fit for use, and those, even in abundant seasons are, in too many instances, inaccessible to the poorer classes; and if no more extensive application of this manufacture were effected than the providing for their wants during that period, its utility must be great and manifest.

"The French, with their characteristic ingenuity, foresaw the advantages likely to accrue from an analysis of the potato, and a better appropriation of its nutritious principle. The Count de Chabrol states, that large engagements have been made for the manufactured farina by the French marine, where, with the addition of a portion of wheaten flour, it is converted into biscuits, pastry, soups, gruel, and panada, and that it is plentifully used by the faculty in the military and general hospitals. Considerable quantities are also manufactured into a kind of paste, of which one pound is equal to a pound and a half of rice, a pound and three quarters of vermicelli, or to eight pounds of potatoes. Several years since, above 40,000 tons of potatoes were annually manufactured into flour in the city and vicinity of Paris, and we are informed that at the present time above three times that quantity is made use of for the same purpose.

"Between the farina of the potato, (properly treated,) and the substance of sago, tapioca, and arrow-root, *there exists no essential difference*—the elements of each are the same, and, of course, possess the same chemical and medical properties. If a difference does exist, it is obviously in favour of the native article, from the probability of its superior freshness, and its exemption from the many accidental injuries to which imported articles are always liable.

"Why, then, it may be asked (acquainted as all our medical men are with these facts) are we permitted to pay for these foreign articles from 1s. 4d. to 1s. 8d. per pound, when we can have, if any thing, a better article, grown and manufactured at home for less than quarter that sum?* This question is answered by stating that, notwithstanding all our facilities for so doing, we have never brought the article forward in a marketable shape, nor made the public sufficiently acquainted with its real properties and uses.

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* Sir John Sinclair's details of the mode of preserving potatoes from year to year, by paring and kiln-drying, are too well known to require insertion here.

"Very many additional arguments could be adduced in favour of this mode of treating our staple article, (*Cobbett's cursed root!*) in order to render it what Providence intended it should prove—a blessed gift, suited not only to the soil and climate of our island, but to the tastes, wants, and constitutions of its inhabitants.

"I have found the dark or red-skinned varieties, at this season of the year, the most productive of farina, which, I understand, is also the opinion of good housewives who are in the habit of manufacturing potato-starch,† a process which (although conducted with an unnecessary degree of tediousness) is much practised throughout the kingdom.

"The cup, from its superior mealiness, is admirably suitable to the manufacture of tapioca: out of two and a half hundred weight of that variety, purchased in this market on the 10th November, for 1s. 6d. per hundred, the produce in pure tapioca was 32¼lbs. besides the refuse pulp, fit for feeding cattle. This produce, if sold at 1s. 4d. would yield to the manufacturer a profit, exclusive of labour and other charges, of 15s. 10d. upon each hundred of potatoes used. I have reason, however, to believe that the lumper would turn out the most profitable of any other; it is becoming every year more farinaceous and palatable, and the expense of cultivating it is much below that of any other known variety. I have manufactured a quantity of them, and found the produce in farina about five per cent. under the cup, whilst their price was more than ten per cent. lower.

"Annexed is a drawing of the simple machinery, which, at a trifling expense, I have constructed for grinding and granulating the tapioca.

"Fig. 1, is a front view of the grating machine. A, is the cylinder (if it may be so called) covered with sheet-iron punched, the burrs outwards; it is two feet in diameter in the front, one at the back end, and two in length. The top is placed horizontal, and the axis consequently inclined, by which arrangement its lower surface forms an angle of nearly forty-five degrees within the horizon, and thereby enables the pulp which may have passed through the punchings to escape. For this purpose openings are left in the front end, through which the accumulating pulp discharges itself, and prevents the possibility of the grater becoming *pulp-logged*, which must be the case, were it constructed in the form of a perfect cylinder, revolving on a horizontal axis. As it would be found inconvenient to turn a winch placed so many degrees out of the line of the horizon, a cogged pinion is placed on the axis of the grater, which is acted upon by a similar pinion on the axis of the winch. B, is a hopper containing the potatoes, covering one-fourth the surface of the cylinder, one-eighth of an inch distant from it. 1, the pinion on the axis of the cylinder. 2, the pinion on the axis of the winch. E, the trough which receives the pulp; F, the frame. Fig. 2 is a front view of the machine. A glance at the figures will at once explain its several parts.

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* "It will be seen by the calculation in another place, that the article which I manufactured stands me in less than 1½d. per lb. (exclusively of labour.)"

† Mr. Cowan's Essay on the late failure of the potato crop.

"Of the straining apparatus it is unnecessary to give a drawing; that which I made use of consists of two circular wire-strainers, of different degrees of fineness; the coarse one to receive the pulp after it it is removed from the trough, and the other for the three subsequent strainings. I apprehend, however, that for carrying on the manufacture in a systematic way, the strainers should be constructed in the form of a cube, and made to revolve in a vessel of water. By this means the tedious process of stirring the pulp with the hand in a flat sieve would be dispensed with; an operation which is otherwise indispensable, in order to separate and allow the farina to pass through the bottom.

"The process of drying and granulating the flour is one of the greatest importance, and requires much care and some experience to conduct. The instrument which I have made use of for this purpose will cost but a few shillings, and performs the work with much certainty and despatch. It is effected by introducing a stream of hot steam under a plate of sheet-iron, five feet long by four feet broad, upon which the farina is spread in a mass of two inches thick. Fig. 3 shows the dryer, and the mode of introducing the steam from the boiler, (for which any common pot or boiler will serve which will contain four or five gallons of water,) and is provided with a close wooden lid. A is the furnace in which the boiler is set; B, the lid of the boiler; C, the tin tube which conveys the steam to the dryer; D, the escape-pipe for the condensed and surplus steam; E, the dryer or kiln, with a ledge three inches deep round the edge, to prevent waste in turning the tapioca.

Fig. 1.

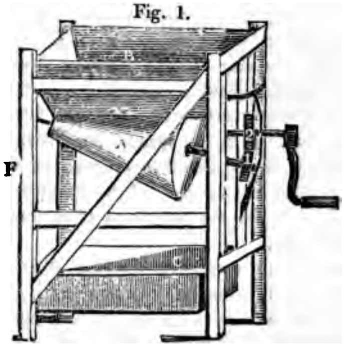


Fig. 2.

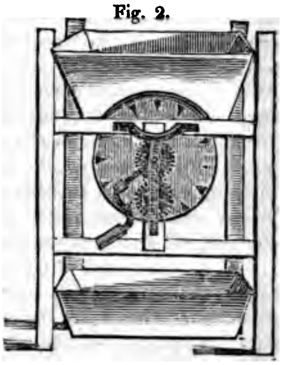
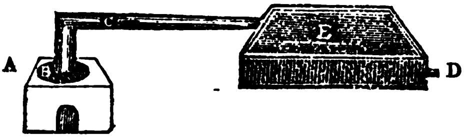


Fig. 3.



"In order to construct the kiln, nothing further will be necessary than to get a strong board of the necessary dimensions, and fit sides and ends about five or six inches deep around it, and then nail on the sheet-iron, with a cross piece of wood underneath to support it, and upon which to join the edges of the sheet. It would of course be necessary to have one or more joints in the large board, as it is unlikely that a whole one of sufficient breadth could be procured.

"Five or six large tubs, or other vessels, will be required for straining the farina into, and washing it when strained. These, of course, need no description; they can be easily procured in all situations.

"The potatoes selected should be of a mealy quality; the flavour is of no consequence, as the principle which imparts the strong or rank taste is soluble in cold water, and passes off in the repeated washings. Neither is it necessary that, for this purpose, they should be deprived of their skins. They must, however, be well washed, and the dirt picked out of the eyes, as the sandy particles would descend with the farina to the bottom of the tub, and no subsequent treatment separate them. The hopper, which contains nearly two bushels, is now filled with the cleaned roots, their own gravity causing them to abrade with sufficient force against the grater. An occasional supply of water thrown on the potatoes will considerably ease the working of the winch, as well as give fluidity to the pulp, and enable it to pass out at the openings in the larger end of the cylinder. The coarser strainer is next charged with the contents of the trough, and plentifully supplied with cold water three or four times, until, on close examination, it exhibits no further appearance of farina.—Should the revolving cube-shaped strainer be employed, two strainings will be sufficient; it will then be only necessary to ply it for ten minutes or a quarter of an hour in a vessel of water, when it may be newly charged. After the strained fluid is allowed to settle for about forty minutes, the top water is drawn or poured off, and a fresh quantity applied, with which the contents of the tub are well blended, and then submitted to a second straining through the finer sieve. After the same interval of time the process may be repeated a third time, when the starch will be found white and clean, and in a proper state to be sent to the kiln. Unless it is intended for laundry purposes, bleaching in the open air may be dispensed with. If, however, the weather will permit, and that there are facilities for so doing, much of the humidity may be got rid of in this way, and the subsequent process rendered considerably shorter. In this way the operations of grating, straining, and drying, may be constantly going on.

"As the temperature of the kiln thus constructed would have the effect of converting the wet farina into a paste or jelly, it will be necessary to interpose some substance between it and the sheet-iron; I have found a few files of paper fully answer this purpose, and bring the temperature down from 212° to about 150°. Any other material which is a bad conductor of heat, will answer this purpose equally well. In converting the farina into tapioca, a lower heat than 150° would be ineffectual. Merely to deprive it of its moisture is not all that is required; a slight approach to solution or paste must be effected, or the substance will want that grittiness which characterizes the foreign tapioca. A few degrees above this heat would convert the mass into a pudding, while a few below would only dry it. In no other way that I am acquainted with, can the heat be so accurately adjusted as by means of this steam apparatus, from the fact that it cannot exceed a certain point, and that point within a few degrees of what is required.

"When a sufficient quantity for one baking is placed on the kiln, it must be kept constantly stirred with a spade-shaped wooden instrument, to prevent it from adhering to the bottom, and to distribute the heat equally throughout. When it is gritty and dry, it may be removed, and a new baking laid on.

"To prepare the farina for cakes, or as a substitute for arrow root, we have simply to dry it; but in so doing it is necessary to mention that the quality i improved by the application of as high a temperature as is consistent with safety to the material.

"Flour and meal from grain contain in addition to their nutritious properties, certain other ingredients which serve to give adhesiveness, and a kind of mechanical structure to the dough. The potato-flour possesses only the nutritive principle, and is deficient in the others—hence its mechanical unfitness to be converted into light or spongy bread. In a pure state, some extremely palatable cakes have however been made of it in our house, with no other addition than that of a little salt. By adding about one-fifth of its weight of wheaten meal,* and a very minute portion of butter, to render it short and brittle, we have had a quality of bread which was preferred by nearly all the family to Manders's sweet and wholesome loaves. To soups and broths we have found it a valuable addition; and, that cheap and excellent puddings may be made from Irish tapioca, there can be no doubt. We have the results of Mr. Mac Innis's experiments to prove this. He says—

"'I ordered a pudding to be made of each, (the Irish and the Brazilian tapioca.) The ingredients, viz., sugar, eggs, cinnamon, and cream, were scrupulously proportioned to one as to the other, and when ready and separately presented for eating, no perceptible distinction could be traced.

"'In appearance, taste, and flavour, they were in every respect the same. If a sensible palate were to pronounce a difference, the decision would perhaps be favourable to the home tapioca, as being more delicate than the other.'"†

Mr. Pooler laments, in conclusion, that he had been so much occupied in preparing and granulating the material itself, that he had no time to try his hand in the manufacture of puddings from tapioca, from which the inference is obvious that this ingenious gentleman wants, and ought to have—a wife.

POULTRY—All domestic birds brought up in yards; as cocks, hens, turkeys, geese, and ducks, &c. The best treatise for the curious in natural history, as well as for the practical rearer of poultry, is that which Mr. Dickson has given to the public. To this we are almost altogether indebted for the information which we are about to offer, in a very condensed form, and only as far as relates to the common kinds of poultry in every farm-yard.

Fowls.—Mr. Dickson enumerates no fewer than twenty-two distinct species, natives of various climates, with several sub-varieties, (undistinguished by any characteristic marks;) but the barn-door fowl, including the mongrel dunghill, is that to which our remarks shall be confined.

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* Wheat ground without separating the bran or husk. This meal I would recommend in preference to fine flour.

† Irish Farmer's Magazine.

"The distinguishing characters of the barn-door cock are, a thin, indented, or scolloped comb, with wattles on each side under the beak, the tail rising in an arch above the level of the rump, the feathers of the neck long, and line-like, and the colour finely variegated."

The combs and wattles of the hen are on a smaller scale, and her colours are less vivid.

The best *dunghill* fowls are those of middle size, dark plumage, and white legs; and let it be recollected that white fowl are of delicate constitution, and, therefore, should not be kept for laying. The largest breed of common fowls reared in England are those bred in the neighbourhood of Dorking in Surrey. They are said to have more toes than are ordinarily bestowed on fowls. Be this as it may, these birds are very large.

But let us begin *ab ovo*.*

Hens, if left to their own impulses, would produce two broods in the year; one early in spring, the other in summer. They begin to lay in February, sooner or later, partly according to the temperature of the air, but more with reference to the time of moulting. When they are casting their feathers, they lose their high tone of health, and cease to lay. The season of moulting is late in autumn, and in consequence of the change in their constitution, while the juices of the body are promoting the growth of new feathers, no *egg secretions* are formed. The months of February and March are usually much colder than those of November and December, yet hens lay abundantly in the former months, while in the latter (unless they have moulted very early in autumn†) they rarely yield an egg. This proves that the coldness of the atmosphere alone does not check the disposition to lay.

M. Reaumur‡ warmed his fowl-houses by artificial heat, but without producing the desired effect. He had not an additional egg for his pains. Yet a stock of poultry, by judicious treatment, may be rendered prolific during the entire year, by having very early and successive summer broods, as the pullets§ (which do not moult in the first year) will lay towards the close of the year. The first brood may be obtained in January, by careful management. *Hot* food—boiled potatoes are as good or better than any other—should always be given in the winter months to the hens which are on the laying list, and which should be kept as dry and warm as possible. Artificial warmth is desirable, and in well-arranged poultry-houses this is easily afforded by stoves, which may be so contrived as to air a harness-room, or warm a green-house at the same time. The hen which roosts in a warm nook of the poor man's cabin, lays earlier in the year than the gentleman's hen who lodges in a cold, damp out-house.

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* A familiar Latin phrase (as we are informed) signifying from the egg, *i. e.* from the beginning.

† The moulting period, after the third year of the hen's life, becomes gradually later and more tedious. Young poultry moult in spring. No fowl are fit for the table at such time.

‡ The inventor of the thermometer which is called by his name.

§ During the first four months the females are termed chickens; they are pullets until they begin to lay, and are then advanced to the rank of hens. The male

For the structure of eggs in the body of the hen, from their embryo state in the ovarium, or egg-cluster, until they are fully and finally deposited in the nest, we refer to Mr. Dickson's work, in which the subject is ably and scientifically discussed.

Every old fowl-woman knows that those eggs only are prolific which are produced by hens who have had *constant* intercourse* with the male, though, for the purposes of the table, they are better without his intervention, as they are more easily preserved in a state of freshness.

The practice of polygamy among fowls, as among the Turks, admits of great latitude, and is generally regulated by no very fixed standard. Some moralists, at the head of whom we may reckon Columella, have recommended twelve concubines for each cock; while others consider that, for the purposes of decorum and social happiness, and other objects, half that number is sufficient.

It is curious that the tone of French *morality*† is much more relaxed on this point than the British.

M. Parmentier, one of the best French writers on poultry has no objection to a score of females for one male; and another writer. of the same school and nation, states that the French housewives consider it a useless expense to have the females in a lesser ratio, and ridicule our prodigality in this respect.

The fact seems to be, that much depends on climate, and the season of the year. In our cold, damp winter, and early spring atmosphere, so peculiarly depressing to the animal energies of the feathered race, the proportion of females to males should be more limited than in the drier and more genial temperature of the climate of France; and for

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is never properly termed a pullet. He is a cock-bird after the first three months, and until he reaches his majority, that is, when a year old.

* This uninterrupted intercourse is necessary with all poultry, for the impregnation of the eggs, with the exception of turkeys. Two visits from the female to the male are sufficient to fecundify the eggs for a season.

† It is still more curious that the ancient name of the French was *Galli*—cocks. —M. D. Jun.

rearing *game fowl*, where athletic vigour is required in the progeny, it may be judicious to limit the special attentions of the male bird to five or six mistresses, but for the propagation of ordinary fowl, no such limitation is necessary.

The qualities of a good cock are described at great length, and in very quaint language, by old writers. Mr. Dickson has given a succinct and good translation of the materials furnished on this head by M. Parmentier.

> "He is considered to have every requisite quality, when he is of a good middling size; when he carries his head high, has a quick, animated look, a strong and shrill voice, short bill, a fine red comb, shining as if varnished, wattles of a large size, and of the same colour as the comb, the breast broad, the wings strong, the plumage black, or of an obscure red, the thighs very muscular, the legs thick, and furnished with strong spurs, the claws rather bent, and sharply pointed. He ought also to be free in his motions, to crow frequently, and to scratch the ground often in search of worms, not so much for himself, as to treat his hens. He ought, withal, to be brisk, spirited, ardent, and ready in caressing the hens, quick in defending them, attentive in soliciting them to eat, in keeping them together, and in assembling them at night."

He adds a test for ascertaining the comparative qualities of different cocks.

> "In making a choice between two cocks, which appear equally fine and vigorous, try them by making them fight together, and select the conqueror, for, as M. Parmentier well remarks, hens, like other females, always prefer the male who shows most courage and spirit."

As may be expected from the number of concubines allowed to the male, unruly tempers are sometimes found among them, which make the poor cock very miserable. Family quarrels frequently occur, and occasionally a cock of jealous temperament is so disagreeable and violent among the females as to require leather fetters on his legs, which render him perfectly meek; but occasions, on the other hand, arise when he is an object of commiseration and sympathy.

> "Cocks and hens, though very social and gregarious, are far from being indiscriminate in their attachments, and when a new cock is introduced upon the death or removal of another, it is often difficult to establish harmony between them. The hens may not like him, or he may not like the hens. Of the first sort of antipathy, that of the hens to the cocks, M. Reaumur mentions the following very striking instance. Hens, indeed, are, no less than cocks, often of a hasty, petulant, and violent temper, often quarrelling and fighting with one another almost as furiously as cocks; but it is not so very usual to see the hens attack a cock, as happened in one of M. Reaumur's coops, in which he kept two hens and a cock.
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> "The two hens in question, after having lived in very good understanding with the cock, and after having laid eggs which he had rendered reproductive, took an

aversion to him, and never ceased to peck him with their beaks, from morning till night. They soon stripped his head of feathers and made it bleed, while he never himself acted on the offensive, and scarcely tried to avoid their attacks. His mildness did not soften their fury, which continued to increase till they tore his head and neck in a pitiable manner, and at length, in five or six days, killed him outright.

"In the room of the cock which had thus been killed, M. Reaumur substituted one which was very strong, sound, and beautiful; but the hens soon showed themselves no less furious against him than his predecessor. After he had been a day and a half with them, they had so rough-handled him that his life appeared to be in danger; and as he was too fine a cock to be thus sacrificed, he was removed from the two harpies, and set at liberty. Two other cocks were successively tried, but with the same success, so that it was found necessary to remove them within two or three days, to prevent their being killed; and no more were given them, as it appeared they would have successively killed all those in the poultry-yard.

"On the other hand, a cock will sometimes show similar spite and aversion to particular individual hens, chiefly, though not always, such as are old.

"We had once a red cock, which so persecuted a large black Spanish hen, though he had previously lived for months on good terms with her, that she was as much in danger of perishing of hunger as from his furious buffetings, for he would not allow her to eat a mouthful if he could help it."*

In hopes of reclaiming him, this offender was whipped, and placed under personal and solitary restraint, but was found incorrigible, and banished in consequence.

The cock should not be kept longer than three years, and the same rule should be observed with other kinds of poultry, especially with turkeys.

In selecting hens, it is only requisite to have them of middling size, of dark colour, bright eyes, short legs, and blue feet, and that they are neither disposed to *crow*, nor be passionate. Hens that are long-legged—and of course ill-formed for sitting—with small body, and very limited compass of wings, should be kept—if kept at all—exclusively for laying. The best age is from two to five years.

The hen testifies her desire to hatch, by making a clucking noise, searching for eggs to sit upon, and by a general restlessness and feverish irritation.

When this tendency is not naturally excited, some *humane* breeders endeavour to promote the disposition to sit by stimulating applications —nettles, for instance—to the belly. A French lady has distinguished herself by her ingenuity, and the amiable tenderness of her disposition, in contriving to make an individual hen-fowl sit three times, and a turkey-hen four times, in succession, by transferring the chicks, when hatched, to foster-mothers.

* Dickson.

The eggs for hatching should be fresh, and free from all offensive smell, and preserved in bran, with their larger end (which contains the air bag) uppermost, and under a warm temperature* for three weeks before they are set. It is safer to have the eggs produced at home, and ascertained to have been fecundated, than to depend on any that have been purchased. In the selection, Mr. D. rejects all small eggs, and those which are of equal size, at both ends, for these have double yolks, which produce unnatural formations. The sex of the future chicken is indicated by the form of the egg; the round egg generally produces the female, and the oblong the male. M. Parmentier gives another and more unerring test—"examine the eggs, by holding them between the eye and a candle, and if the vacancy caused by the air-bag at the blunt end of the egg, appear to be a little on one side, it will produce a hen; if this vacancy be exactly in the centre, it will produce a cock.† From 9 to 15 is the number usually placed under the hen, according to her size. Her nest should be of clean, short, and soft straw, if possible on the floor, and facing the south, as the hen, if left to herself, selects the ground for incubation, and corn and water should be placed within her reach; but the food should be removed as soon as she satisfies herself. Many hens feed but once a day, and some would starve themselves sooner than leave their eggs in search of food.

The hen sits for three weeks; about the twenty-first day the chicks chip the shell with the upper bill, which is furnished with a horny, pointed scale at the end, and gradually extricate themselves from confinement; frequently they do not disengage themselves from their native cells in less than twenty-four hours, or even more; but it is generally much better not to assist them in breaking the shell, for if this be done before they have taken in the necessary supply of sustenance, by the yoke passing into their bodies through the navel, they will assuredly die. It may, however, sometimes be absolutely necessary to afford them aid, for it occasionally happens that their bodies adhere from bad hatching to the shell, and that their naturally revolving movements do not tend to disengage them. They must, in this case, be very tenderly relieved by the hand, else their delicate membranes would be hurt, and their feathers torn away.‡ The querulous chirping of the forthcoming sufferers will give evidence of this. "When a large fracture that has been made in a shell, together with a rending of the membrane, remains the same for five or six hours, and is not enlarged, it may be concluded that the chicken adheres to the inside."§

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* 96° of Fahrenheit. † Dickson, p. 137. ‡ Ibid. p. 141.

§ See Dickson for the *mode* of extricating the prisoner in this case.

On the day *after* they have been hatched, Mr. Dickson says, the chicks may be removed from the nest to a basket or some similar receptacle, lined with wool or such soft, warm substance; but our practice is against removing any new-born poultry from the original nest. For a fortnight they are fed with crumbs of bread soaked in milk,* and thenceforth, every day for some time with yolks of eggs, curd, grits, &c., and after a few days, they may be allowed to peck about in warm spots, with their mother, but must be guarded from *wet*. They will soon feed greedily on meal, crumbs, &c. mixed with a small portion of potatoes, chopped leeks, beet leaves, parsley, or cabbage.

Fowls in a natural state, picking up what they can get at the barn-door, are, in our estimation, the best-flavoured, and most wholesome for the table; but the poulterer in catering for the epicurean palate of his customers finds it his interest to have grossly fat heavy fowl. The subject of *fattening*, therefore, must be here discussed.

The most approved coops are those which are divided into solitary chambers, so narrow as to prevent them from turning round, and with an open in the rere part for the discharge of the excrement—perfect cleanliness being indispensable—with meal and milk in a trough, and a little brick-dust (to promote digestion) at front. The principal digestive organ of fowls, is the gizzard, a peculiar and most powerful muscle, the inner coat of which is fitted up with rough plaits, which, by a strong friction against one another, break and grind the hard aliment as effectually, and by a similar kind of mechanical action to that of a coffee-mill. It has been proved by the most correct experiments, that the gastric juice of these birds will not operate upon the *entire* grain, not even when softened by water or macerated in the coop; therefore, without a grinding machine within its body; without the trituration of the gizzard, a chicken would starve upon a heap of corn."†

The gluttony of man, besides leading him to imprison fowls for fattening, as closely as it is possible, has suggested to him another more expeditious and more efficacious mode of rendering chickens and fowls excessively large and fat—namely, by what is called *cramming* them, with a paste made of flour, or meal, milk, and hog's-lard, or kitchen grease, introduced by means of a tube, or by the fingers, when a funnel is not at hand. In the course of a fortnight, chickens may be rendered sufficiently fat, and of great weight; and, happily for the poor victims, they quickly lose all recollection of former liberty, and seem reconciled to a life of indolence and plenty, and conduct themselves as if they deemed it their duty to get fat as fast as possible. The cramming funnel is accurately described by Mr. Dickson. It acts on the principle of the forcing-pump, and supplies food until there is room for no more. One would think that all this is bad enough; but it is perfect benevolence compared with the modes invented by ferocious man, for fattening *geese*, as will be referred to in the sequel. For the modes of making *capons* of the male, and *poulardes* of the female pullets, (which latter condition they attain by modern experiment, with little or no pain, by merely cutting the egg-tube across,) the reader may consult Mr. Dickson's work,* as well as for the treatment of the various ailments to which fowls are liable, among which are enumerated, pip, derangement of the digestive organs, (causing many affections similar to those in the human species,) roup, catarrh, asthma, consumption, rheumatism, and *gout!* most, if not all of which are occasioned by cold moisture. To the same authority we refer for details of the modes of artificial hatching by ovens, so much practised in Egypt, and successfully in France, by various contrivances to supply an "artificial mother." It is only necessary to add, that the most healthy situations for fowls enjoying their liberty, is on dry, calcareous soils, and that they should have free access to gravel, or sifted ashes, for rolling in, to relieve themselves from the annoyance of vermin, for cleansing their feathers, and possibly for *amusement* alone, and that the fowl-houses for roosting in should be dry and warm.

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* The French often use wine.

† Paley's Natural Theology, illustrated by Lord Brougham and Sir Charles Bell. "A gizzard is not found in birds of prey."—*Ibidem.*

The indications of good health are, a florid colour of the combs, and bright eyes free from moisture, dry nostrils, and bright glossy plumage.

TURKEYS.—The wild turkey is well known in North America. There it principally feeds on berries, fruit, and the seed of the nettle-plant, and periodically affords to the sportsman, amusement, and exercise, and food. The flesh, however, of this bird, in its natural state, is dark-coloured, and by no means of the same delicate flavour which it acquires when domesticated. The turkey was not introduced into England until the reign of Henry VIII. though before that it was reared in Spain. No species of our poultry is so delicate in infancy, but when once reared, the turkey is remarkably hardy, and, if there were no danger of his being stolen, might be left to roost in the open air during the coldest seasons of the year. The utmost that is necessary, is to make his roost under a shed to protect him from heavy rain. His habits are of a rambling character, and confinement is odious to him. The range for turkeys, therefore, should be as extended as circumstances will allow. In their natural state, the males remain together in companies, and apart from the females, in autumn. When the young birds are about two-thirds grown, the old cocks look upon these as rivals, and hate them accordingly; while, on the other hand, there is a dread of the old cocks on the side of the females and their offspring. But when, early in the spring, the hen issues her call-note, after much previous coyness, and roosting on a distinct tree, (though in the neighbourhood of the cocks, after a great deal of *gobbling* noise, and a pompous exhibition of their persons by the conceited male to the admiring hen, and a corresponding ceremonial on her part, which altogether is a very entertaining burlesque on the old-fashioned court minuet,) the match is fairly made up, (many duels perhaps having first occurred among the suitors,) and there is a tolerable degree of family peace afterwards between the cock and the moderate number of wives who attend him, and have the privilege of "roosting on the same tree, or at least in its immediate vicinity, till the time of laying, when the hen has recourse to every stratagem to conceal her eggs from the male, and even to avoid him, except during a short period each day. After this, the cocks become clumsy and slovenly, if one may so speak; they cease to fight with each other, give up gobbling, or calling so frequently, and assume so careless a habit, that the hens are obliged to make all the advances themselves."* The same liberal allowance of wives for each male of the fowl class, may be considered as sufficient for the turkey-cock. Though he is such a provokingly consequential animal, in spirit, however, he is very inferior even to the common dunghill cock, and, notwithstanding his strut and swagger, and fiery gills, would at any time run away from a determined opponent, though not quarter his size. In short, he is a coward, and consequently a bully. The turkey-hen, in the domestic as well as the wild state, endeavours to conceal her eggs; but at the season of laying she gives a peculiar note, by which the poultry-keeper has a warning to watch her movements.

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* Pp. 193, 194, 195, 196.

The cock must be kept away from the laying hens, in the morning especially, as they will break the eggs if they can, and annoy the hen.

The eggs should be regularly collected and kept in some dry dark place, until the hen has finished laying, and is desirous to hatch.

The same barbarous stimulus of a flogging with a sprig of nettles, prescribed for hen fowls not readily disposed to sit, has been tried for turkey-hens; and also a dose of brandy and water to make them drunk when they are placed on the eggs,† to insure their sitting on their becoming sober. The dark-coloured turkeys are by far the best.

Any number of hens may be placed under the same shed, at short distances from each other, taking care that they are kept quiet and dark as well as warm.

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* All this is very often applicable to other creatures than turkeys.

† M. Parmentier's benevolent experiments. See Dickson, p. 224.

"The nest may be formed of a circular pad or roll, stuffed with matted straw, and about fifteen or sixteen inches in diameter; the inside being filled with soft bruised straw, on which the eggs are laid, which being secured by the border will not roll about when the hen makes a motion to get in or out of her nest, or turn her eggs."*

When several hens hatch at the same time, commencing together, it is obvious that if any accident should happen to one of them, the eggs may be at once transferred to some of the other nests, "the evening being the proper time for this, so that on the morrow the new-comer may appear to be of her own family." And there is a farther advantage—namely, that some of the mothers after hatching may be employed for sitting on the eggs of common fowl, or in laying again, while their chicks are taken care of by some of the other hens, for one of these can undertake the guidance and care of a great number of chicks, and she generally evinces as much maternal affection as if she were not a foster-mother—for the plain reason, that she fancies herself the real parent.

The turkey-hen whose eggs have been transferred either on the point of being hatched or before, will readily sit upon any other eggs, for she is a very assiduous nurse; or after laying, she will sit upon the eggs of any other birds. Those of fowls are often put under her, either with or without other eggs; but a mixture has many difficulties and disadvantages, among which—even supposing them all simultaneously hatched, in consequence of previous accuracy of calculation as to the days on which the different eggs should be put in the nest—there is one which is very serious, the distraction of thought occasioned to the mother by the different instincts of her brood. She will not know how to divide her maternal attentions. The laying of the turkey-hen being over much earlier than that of the common hen, earlier pullets will be obtained by putting fowl's eggs under the turkey-hen, and as they are hatched *ten days* sooner than those of the turkey, the turkey-hen has an abridged period of her natural term of sitting, and may, consequently, sit again in the course of the season, if, as before stated, she is not kept for laying more eggs. Turkey-cocks have been rendered useful by being trained to sit; this they can be induced to do by clever management, but when the chicks are coming forth, the male nurses are sadly scared and frightened, and may, by their embarrassment and awkwardness, destroy the entire brood. This reminds one of the countryman who was desired by his wife to milk "Steenie" the cow, which he contrived to do pretty well; but just as he completed his unwonted task, "Steenie" raised up her heels, and kicked him and the pail to such purpose that he said; (or sung, as the tale goes,)

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* Dickson, p. 225.

> "A woman can do as much work in a day,
> As a man can do in seven."

On the thirty-first or thirty-second day, the chicks, as in the case of fowls, will chip and break their shells, and get out, unless prevented by the adhesion of the body to the pellicle of the shell. When (and this direction equally applies to all poultry) a small hole is perceived in the shell, through which the bill can be seen, and the chicken appears unable to break through the shell completely, the shell should be slightly and gently broken on the outside, and lifted up with the point of a pin, but with care not to touch the chick.

A few drops of wine are frequently given on the continent to reanimate drooping chicks, and Mr. Dickson recommends bread soaked in wine for them at first; but the natural warmth of the mother's body is the best physician, and this they should as quickly as possible enjoy, as the external atmosphere is so cold compared with that in which they had previously existed. The early feeding of young turkeys is very similar to that recommended for fowls. Egg is a favourite food for them. They may very soon have nettles and parsley made into balls, with groats or meal boiled to the consistence of stirabout, which they learn to peck from the hand. As the mother is very stupid, and never has brains enough to teach her little ones to search for food, a keeper is necessary for young turkeys, in order to feed them frequently, to take them out airing after the dew is off the ground, and place them in shelter either from the hot sun or rain, for six weeks, when they become pretty hardy, and can eat boiled potatoes mixed with their meal. The membranes of the neck and head now *shoot the red*, as it is termed, and at this critical period poults require very high feeding. After harvest, turkey poults† are driven in large flocks to pasture and stubble fields, where they learn to pick up insects and grains of corn, and then they are quite independent of the maternal wing, and flock with the turkeys of more advanced life, and roost with and accompany them. But care should be taken to have shade or shelter always at hand for them during the sultry hours of the day, and when rain is falling.

After six months turkeys may be crammed like fowls, with the same kind of food, but need not be so closely confined, though a dark place is recommended for them. It requires six weeks to render turkeys perfectly fat, and it would be barbarous to confine them in pens all this time; they may be left in close farm-yards. Balls of barley-meal alone are the most efficacious during the latter part of the cramming course.

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† After two months they attain this denomination.

To have very large turkeys for table at Christmas, from 20lbs. to 25lbs. weight,* cocks should be kept over for fattening until they are nearly two years old.

The Norfolk turkeys are proverbial for their size; but a young hen turkey in spring is much better in flavour—one is a monster to be gazed at, the other a delicacy to be enjoyed.

In their ordinary run about the farmer's yard and fields, turkeys nearly feed themselves sufficiently; if not, by scattering oats or other corn among them in the morning they will thrive sufficiently. Care must be taken not to let them enter the kitchen-garden or cabbage-field, as they eat every green leaf with great avidity. Boiled potatoes or Swedish turnips greatly assist in the support of a flock of turkeys.

The principal disease to which turkeys are liable is the pip. This is ascribed by some to their using bad water, or to their want of it altogether. The disorder is perceived by examination of the tongue, the membrane of which is dry and *thickened*, while at the same time the patient holds the mouth open in a gasping manner. Unless the ailment be removed, which is easily effected by peelling off the membrane with the nail or a needle, the bird cannot eat, and therefore pines away.

A turkey labouring under the pip is a very pitiable object; he is the very personification of misery; he looks exactly as if "Melancholy marked him for her own."

Among the numerous diseases of poultry, there is one, by the way, termed "melancholy," or "moping," which originates probably in indigestion.

GEESE.—The goose is an excellent bird, and highly valuable to the farmer on account of its hardihood. There are varieties of the tame goose, (though none of the wild,) but the white ones are considered the most delicately flavoured.

To *rear* geese, the contiguity of a pond at least, is indispensable, though in fattening them, bathing is forbidden. The numbers reared in the fens of Lincolnshire, and in Suffolk, and Norfolk, are prodigious. It is said that some of the poulterers in the vicinity of London fatten 5000 geese in the season.

Geese, though fond of dabbling in the water, are particular about their lodgings at night. These should be dry and clean. On account of their aquatic predilections, and their disposition to quarrel with other birds when confined in yards, they are better kept distinct from other poultry; and their dung is so offensive to cattle on pasture grounds, that they can only be bred with real advantage in the neighbourhood of lakes and rivers, (on the marshy and worthless margins of which they can feed,) or on coarse, bog pasture, which may be rendered very profitable if devoted to the support of these easily fed birds. Some kind of grass they must have, as this agrees with them, and without such aid they could not be kept with economy, as they feed voraciously. Wherever *commons* abound, with pools of water, the peasantry derive great profit from rearing geese; and though the enclosing of any commons is on the whole a national benefit, the loss to poor individuals is sometimes serious, at least we must so infer from the complaint of some rustic poet—

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* The weight of a live turkey to a dead one is as 3 to 2.

> "It's a great shame for man or woman
> To steal a goose from off a common;
> But sure that man's without excuse
> Who steals the common from the goose."

Geese live to a great age; instances are on record of their having attained the ordinary limit of man's age.

The gander is rarely allowed more than six wives; and he will be quite content with one. The most approved colour of the gander is white, but the grey goose is preferred by many.

Geese, well fed, and kept in warm, dry lodgings at night, will lay early in March, and may be made, with great care, to produce from twenty to fifty eggs without intermission, though their most usual habit is to lay from five to twelve eggs, twice or thrice in the year. If the goose be cooped up on the first occasion, to lay in a particular spot, she will afterwards deposit her eggs in the same nest. The nest for hatching should be made of soft straw; and when the laying is over, from fifteen to twenty eggs should be put under her. Her period of incubation is one month.

Many persons, in order to obtain as many eggs as possible from the goose, have the hatching duties executed for her by deputy, either by a common hen or a turkey. The latter is a much more desirable nurse, as she can cover so many more eggs than the other, and is naturally disposed to sit during the same period.

An empty glass crate, with a sack or mat thrown over it as a curtain, makes an excellent bedstead for a hatching goose.

The same precautions and treatment necessary for other poultry should be observed in the liberation of goslings from the shell, though there is probably less danger in assisting the prisoners of this tribe from their confinement than in the case of more tender shells and less hardy birds; but in all cases the less interference with the natural instincts of the mother and her brood the better; and none but experienced persons should attempt to open the shells. Goslings may take a walk in the open air, in very fine weather, on the third day after their birth, for a short time, with the precaution of shading them from the hot sun. Their food at first should consist of barley or oatmeal, but afterwards grits may be given, of much coarser quality than that for chickens; a small portion of bran, after a little time, may be mixed with boiled potatoes; but like chickens they must be fed frequently at first, as they are greedy. Green food from the garden is scarcely a necessary ingredient in their mess, as they supply themselves liberally with grass when they become strong. If, however, they have no pasturage, they should be supplied with garden offal chopped up in their food. Geese are fattened by cramming when in that state in which they are denominated *green* geese, in November. The same mixture of barley or oatmeal with potatoes, worked into paste with milk, is used in each case for cramming; and an active, epxert woman can *stuff* ten geese in an hour, with the aid of the cramming pipe; a "tin funnel, with a pipe five inches and a half in length, and less than an inch in diameter, with the end sloped off like the mouth-piece of a flageolet, and rounded at the edge, to prevent its scratching the throat when it is introduced. A small, round bag is adjusted to the pipe, through which grain is introduced into the crop. The operator sits squat on the ground, holds the goose with one hand, introduces the pipe of the funnel into the mouth of the goose with the other, and introduces the food till the crop is filled. Water is at the same time given to the goose to drink, and must always be left near them, as the cramming renders them very thirsty." When regularly crammed, which is too frequently the case in France, and for the London market, they are very closely cooped up; but this is detestable and unnecessary barbarity. Geese do not by any means require this cruel and artificial treatment; if turned out on stubble, they soon become exceedingly fat, and much better flavoured than if gorged by compulsion. Having excellent appetites, they feed greedily on raw potatoes or Swedish turnips if sliced for them, and will even fatten well on this food if confined to a yard; some oats twice a day, and barley-meal once, with milk or water, should be their only food for the last fortnight of their lives. Of all things, greasy paste is the most detestable, as it gives a strong and abominable flavour, and tends to render the flesh loose and flaccid. They require no delicate attentions whatever.

The usual French mode is to put geese by thirties in the same house, but divided into companies of eight, separated from each other by partitions. They are often kept so closely wedged that they cannot stand upright or turn. Diabolical barbarities have been practised in Paris to enlarge the livers of geese. They have been blinded in the first instance with hot irons, and then nailed by the web of the feet to boards near a fire; then crammed with balls of paste highly peppered; and at length, when disease has enlarged the liver to the utmost possible point of unnatural distension, the epicure, man, sits down to his gluttonous feast; and we cordially wish him to feel the horrors of indigestion as the too lenient punishment of this cruel indulgence of his depraved appetite.

A French queen has obtained an immortality of infamy from paying 1500 livres for fattening three geese in order to have their livers of extraordinary delicacy.

Geese are regularly plucked* twice a year, (early in August and at Michaelmas,) for the feathers, by wretches who go about for the purpose of purchasing them. As may be supposed, they pull out the feathers in the most rough and rapid manner to save time, without paying the slightest regard to the screams of the tortured birds, and injure the wings, which draggle in a sore and bloody state on the ground. After this operation, geese are sick and thin, and in reality and appearance, especially in cold weather, very miserable, (they frequently die,) until the new feathers cover them, when the same barbarities are repeated.

Humane housewives do not allow these operators to *pluck* the quills, (which naturally fall once a year,) as this injures the wings, nor any feathers except those on the belly and sides. But many less tender goose-owners give the birds to the tender mercies of the pluckers every six weeks, except in winter, at three pence per head, for a thorough stripping of *all* the feathers—the down alone being left to protect the spine.

Ducks.—Our tame, dark-coloured breed came originally from the banks of the Rhone, and had its origin in the wild mallard. The white variety is not so well flavoured; but as they grow to a very large size they are much esteemed, especially in the neighbourhood of London. The Muscovy duck is a distinct species. In a wild state, the drake is of a brownish black colour, with a broad, white patch on the wings; the female being smaller and dimly coloured. In the domestic state, it exhibits every variety of colour like the common duck. It is a good breeder and easily fattened.

The cross between the Muscovy and the common duck has a deep green plumage; but their eggs are not prolific. Ducks are very hardy, and but little particular about the quality of their food, provided they can have a sufficient quantity; and garbage of any kind—animal or vegetable—is so palatable to them, that no farm-yard should be without them. They will even pick up ample means of subsistence on the fields or roads, and in the garden, especially, in which they are really often useful from their activity in devouring snails, slugs, and insects. The necessary treatment as to laying, hatching, &c., in the beginning, is so similar to that which has been already described that it would be mere repetition to enter into the particulars.

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* Pennant says, that "in Lincolnshire they are plucked *five* times in the year; first at Lady-day, for the feathers and quills, and four times for the feathers only, between that and Michaelmas."

The period of the duck's incubation is the same as that of the turkey and the *goose*. She cannot cover more than eight or ten eggs, and rarely lays more than she can hatch; and on account of the superior care bestowed upon the young brood in their first days by the common hen, in preferring dry fields to pools of water, which are prejudicial to very young ducklings, it is very common to make one of them the foster mother.* This, however, occasions much real misery to the poor hen when she sees her brood rush recklessly into ponds, in which she apprehends for them all the perils of drowning, as they, following their instinctive love of bathing, and heedless of her efforts to withdraw them from supposed danger, rush into the element they love; besides it inflicts on these "borrowed mothers" a week's longer confinement than their natural term of incubation.

The early feeding and general treatment of ducklings is the same as that prescribed for goslings, except that no green food is given to them, as this is not a natural aliment for them. There is to be the same precaution to keep them for a fortnight from the pond, though they may be allowed after four days to *paddle* in a flat dish; and for this object the mother should be cooped up with them for a few days, except for a short period each day, and under strict superintendence. They may, like goslings, have plenty of boiled potatoes mixed up with their meal, with a flat bowl of clean water for drink; and after a month they will eat raw corn if it comes in their way; and worms, which they pick up themselves, are their chief delicacy. As they are very voracious, they should have abundance; they will thrive according to their feeding, with little trouble. Ducks are seldom or never crammed, as they fatten sufficiently while at large, nor need they be debarred of the pleasure of bathing in moderation; all they require to render them grossly fat is some corn, at least once a day, mixed with their potatoes, and *milk*, if convenient, and opportunity to pick up offal of all kinds.

All poultry like a change of food, and will often leave a profusion of corn for the grass and insects of the field.

In some parts of France they *do* cram ducks like geese, and with the certainty of rendering them balls of fat in three weeks. This barbarous practice with respect to any kind of poultry cannot be too strongly deprecated. The taste which leads to a preference of *diseased* animals (even abstracted from the consideration of the tortures they are to undergo in gorging loathsome food) is a depraved one. And those who knowingly, and by preference, consume crammed poultry, are guilty *accomplices*, *after the fact*, encouragers of a trade which ought to have no supporters, and highly criminal in the eye of humanity.

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* 12 duck-eggs may be put under a common hen, and 18 under a turkey. It is useless to put more, as there will not be sufficient warmth to render them fertile.

If poultry must be kept together in the same yard, and the same house at night, care should be taken to have the *upper* parts of the building with roosts for fowls and turkeys; and so contrived that the dropping should not descend on any other poultry resting under them.

Geese and ducks can have their recesses at bottom, built in the wall. Ashes and gravel, on a dry surface, should abound in the yard, as poultry generally are very fond of scraping for amusement; and gravel is good for digestion. A contiguous field is essential to their health. "Cleanliness, dryness, kindness, and full feeding are the secrets of success."

RAGWORT, or RAGWEED—A weed with a perennial root. This grows to the height of two or three feet unless extirpated, which is easily done by a strong pull, after rain. It often infects pasture-land, except when devoted to sheep, which eat it closely down when it is young, and by destroying the crown, prevent its re-appearance.

RAM.—(See *Sheep.*)

RAPE.—A plant of the cole kind, greatly cultivated in Flanders, for the sake of the seed, but extremely valuable also as green food for cattle and sheep in winter and spring.

There are different varieties of the plant and different modes of treating it according to the uses for which it is designed.

The species called colza, (*Brassica campestris,*) is that which the Belgians prefer, the leaves of which are *rougher* than those of our common kind, when oil alone is the object; with them colza enters into regular rotations on good clay soil, and is considered "an excellent preparation for wheat, as may be well supposed when it is considered how the soil is tilled for this plant, how much it is manured, and what care is taken to keep it clear from weeds."*

The whole treatment is so well described in the invaluable treatise from which the last sentence has been taken, that we cannot, in justice to the reader, avoid giving the entire passage:—

"In the polders, where fallows are still occasionally resorted to, colza often supplies their place. It is sown broad-cast in July, as turnips are. The ground is ploughed in autumn and in spring, and again a short time before the seed is sown, and well manured with farm-yard dung. The seed is sown very thin, and harrowed in: as the plants come up they are weeded and thinned out, so as to leave them nine inches or a foot apart. Before winter they have acquired a considerable size, and the stems have had the earth drawn up to them. Thus they remain all the winter without injury from the frost: in spring they are weeded again, and the earth gathered round each plant, which ensures a vigorous growth of the seed-stem. After flowering in April and May, the seed-pods fill, and begin to get ripe in June or July: care is taken to cut the crop before the pods are fully ripe, or they would shed a great part of the seed. Dry, warm weather suits this best; as then the stems may be laid on the ground for a short time to dry, and the seed may be immediately threshed out on a cloth in the field, which is soon accomplished if the weather permits. The crop is then safe, and is stored in a dry and airy granary till it is sent to be crushed.

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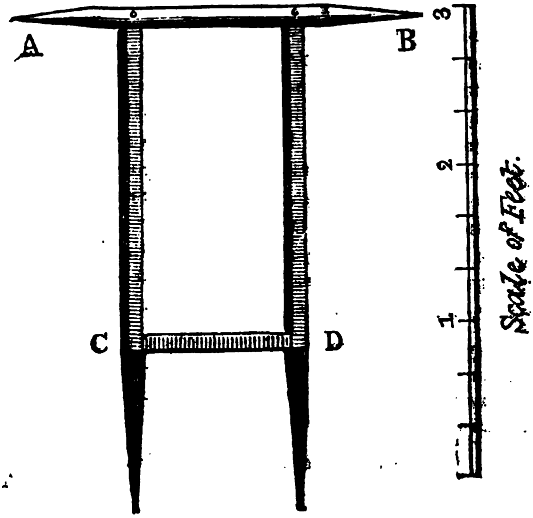
* Outlines of Flemish Husbandry.

"But this is not the mode in which colza is cultivated in the other parts of Flanders, as there fallows are unknown, and the land is never left idle. The seed is sown in a bed of good earth, prepared on purpose to raise plants to set out after harvest, when the land has already yielded a profitable crop. These plants are taken up carefully in October. When the stubble has been cleared of weeds by the harrows, the land is well manured, ploughed to a good depth, and laid in stitches; the plants are then brought in baskets to the field. A man, with a wide spade, made on purpose, opens a gap in the soil, by planting in the spade vertically, as far as the blade will go, and then pressing the handle towards his body; a woman or child with a basket or bundle of plants immediately sets one in each corner, and the spade handle being replaced in a perpendicular position, the earth falls back upon the two plants. The man, when he has drawn out the spade, puts his foot between the two plants, and thus presses the earth against their roots. The whole of this operation is performed in far less time than we have taken to describe it; in fact, practice gives such dexterity, that a double row of plants is set in a very short time all along the bed; the next double row, which is set in returning, is eighteen inches distant from the first, and the plants are placed so as to alternate with those in the first row. Instead of a spade, some use an instrument called a



plantoir, which makes two holes at once, and is pushed in with the foot pressing on the cross bar C D, (see fig.) while the handle A B, is held in both hands. In this case a plant is set in each hole by a person following the dibbler, and the earth is pressed to it by the foot. Whichever way the plants are put in, some will always fail, and a supply is kept in the seed-bed to replace them at any time in autumn or spring. The intervals between the rows are hoed and weeded, and even sometimes dug with the spade, which is a good practice; and the plants are treated as cabbages are in a garden. In November, before the frost sets in, the intervals between the stitches are dug out, and the earth placed in small heaps between the plants, both to receive the mellowing influence of the frost, and to protect them against very cold winds, which, when there is no snow, sometimes injure the young colza. In spring these heaps are levelled, and the earth is raised around the stems. They cannot fail to grow and shoot out strong seed-stems and succulent leaves. These leaves are much relished by cattle, and this sometimes induces the small farmer to gather a portion of them for his cows, at a time when fodder is scarce; but he pays dearly for this supply, by the diminution of the seed, which is abundant in proportion to the luxuriance of the leaves on the stem at the time of flowering.

"When the colza is cut, it is threshed, as described before, unless the weather be very unfavourable; in that case it is dried, as well as circumstances permit, without much handling; it is then laid in layers with dry straw, and stacked in the field, or carried to the barn. This plan is, however, seldom resorted to in Flanders; the season in general permitting its being housed in a dry state, if not threshed in the field.

"To save time and trouble, the plants of colza are sometimes put in with the plough, being set in the furrows, as we have described in planting potatoes; with this difference, that the plants are set upright, or rather slanting a little against the furrow-slice last turned up, and the return of the plough covers the roots, leaving the crown above ground. A man goes along the furrow, and with his foot presses against each plant to settle the earth around it. This method is not so much practised in Flanders as it is in other parts of Belgium, where the extent of farms is much greater, and where so much labour cannot well be spared for each crop. It is a less perfect method, and the plants do not take root so certainly, or grow so well as by the other.

"An acre of good colza produces on an average thirty bushels of seed. In March, after the colza has been hoed, carrot-seed is often sown in the intervals; it comes up well, and after the colza is reaped, and the ground has been cleared of the stumps which remain, the carrots are thinned out, and get to a good size before winter.

"The colza is sometimes sown thick and broad-cast, to serve as food for cattle and sheep in winter and spring, but the *Navette** (*Brassica napus*) is more usually sown for this purpose."

Mr. G. F. Russell, a correspondent of the Irish Farmer's Magazine, has added a gauge of the same length with the lower cross-bar (and as nearly as possible on the same level) projecting from one of the up-

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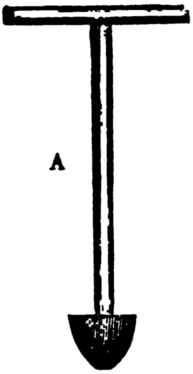
* This is our common species which yields more leaves, but less seed than the *Brassica campestris*.



rights. This is to allow the workman to move the instrument more quickly on his line of operation, and to keep the distances without any loss of time. Mr. Russell states, that with this double dibbler he can set 2000 plants in the hour, 12 inches apart, which distance he prefers, as allowing the advantage of cutting away every alternate plant at an early period for his cattle.

With the implement A, here described, " he forces the point into the ground about two or three inches behind each plant, which closes the hole, and sets them up firmly."

When rape is used as a substitute for a fallow crop, and for sheep-feeding in autumn, it is sometimes treated in the following way, as detailed by Mr. Culley of Northumberland :—

> " Rape may be sown from the 24th of May to the 8th of June, but comes to the greatest growth if sown in May. If sown earlier it is apt to run to seed. From two to three pounds of seed is required per acre, sown by a common turnip-seed drill. But as rape-seed is so much larger than turnip-seed, the drill should be wider. When hoed, the rape should be set out at the same distance as turnip plants. The drills should be from 26 to 28, or 30 inches, according to the quantity of dung given. As many ploughings, harrowings, and rollings, &c., should be given as may be necessary to make that kind of poor soil as fine as possible, and cleared of twitch, &c.; the produce will be from 25 to even 50 tons per acre, or upwards. But it is not so much the value of the green crop, (although the better the green crop, the better will the wheat be,) as the great certainty of a valuable crop of wheat, that merits attention. The sheep are put on from the beginning to the middle of August; they must have the rape consumed by the middle or at latest by the end of September, so that the wheat may be got sown on such poor, damp soils, before the autumnal rains take place. The number of sheep must depend upon the goodness or badness of the crop. But as many sheep must be employed as to eat the rape by the middle of September, or end of that month at the latest, for the reasons formerly given. The Burwell red wheat (so called from a village in Cambridgeshire) is always preferred. Poor clays will not allow deep ploughing; consequently that operation must be governed by the depth of the soil. The land must be made as clean as any naked fallow. There is scarcely an instance known of a crop of wheat sown after rape, and eat off with the sheep, being mildewed; and the grain is generally well perfected. Mr. Culley has known a crop of wheat after rape, upon a poor, moorish, thin, clay soil, worth much more than the fee simple of the land that produced it. He has frequently known land, both after rape and after naked fallow, in the same field; and invariably the rape wheat was better in every respect than that after naked fallow."*

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* Husbandry of Scotland, Vol. II.

The superior excellence of wheat after rape is testified abundantly.

After paring and burning on bog land, rape is grown with great advantage. (See *Manures.*)

The *Brassica napus* is that which is cultivated by us, and usually for the purpose of cattle-feeding. When for this purpose, the best mode of preparation and treatment is as follows:—Let a sufficient quantity of seed be sown in April in garden seedling-beds, well manured and properly dug.

After the field has been sufficiently ploughed and harrowed, as for turnips, open drills in July, whenever the weather is sufficiently moist, three feet asunder; put in the manure, drop the plants two feet apart in the row, and close them with the double mouldboard plough, taking care to have them raised and placed in an upright position if interred or declined too much by the plough. They are to be moulded and cleaned afterwards when necessary.

According to the quality of the soil and the manure, will be the luxuriance of the crop in the following winter and spring, when it should be brought daily to the cow-byres or sheep-pens. We do not recommend the culture of rape on soil well suited to turnips; but on bog-land, or on cold, wet, clay-land, where turnips would probably fail, rape may be drilled with great advantage. The furrows between the rows will drain the land during the winter and spring, and therefore prepare it well for a corn crop.

Under certain circumstances we have known rape to be the very best crop that could, by any possibility, be cultivated; for instance, near the sea-side, on indifferent soil, not ready in the season for sowing potatoes, and without any prepared manure.

By ploughing and harrowing the ground sufficiently before the middle of July, and then drawing dried sea-ware (See *Sea-ware*) from the coast, and applying this as for potatoes, good crops of rape have been raised, when otherwise the land would have been waste for that season; and in the ensuing wet and cold spring, the cattle experienced its value, while the dunghill testified its richness.

Rape is very hardy; with fair treatment it never fails on any soil. Where bog is annexed to a farm there is no excuse for not having it. (See *Manures.*) A common mode of sowing it, especially if it be for the seed, is broad-cast, with furrows to take off water, or in drills on a flat surface.

Rape is also sown very advantageously on stubble land for a spring bite for ewes; and this is an economical mode, on loose land not requiring a winter's ploughing, as the plants fed on the ground are serviceable to it, and are ploughed out in time for the succeeding potato or turnip crop;—8lbs. will sow an acre. After *early* potatoes rape comes in with great advantage, an additional crop being thus gained without the necessity of an extra manuring; and no point should be more regarded by the farmer than that of having an intermediate crop whenever he can, provided it does not exhaust or essentially interfere with the proper preparation of the land.

Rape fattens cattle so successfully, that several farmers prefer it to turnips; and we are well aware of very heavy and fat stock having been sold in the Dublin Smithfield market last spring, which were fed on rape instead of turnips, by the deliberate choice of the gentlemen who fattened them after a long experience of the relative merits of rape and turnips on their peculiar soil.

REAPING—The operation of cutting corn with the sickle, which is an instrument of a two-fold description. One sort, which is used principally by the British labourer, has a smooth blade of wrought iron and steel, about twenty-five inches long, and curved nearly to a semicircle; the other, which is universally preferred by the Irish reaper, has a finely serrated edge, and towards the lower point recedes from the curved direction to nearly a straight line.

In reaping with his teethed sickle, the workman takes the corn in his left hand, and cuts it as near the ground as he can, drawing it towards him at the same time. And this mode makes very clean work, so much so that an experienced writer in the Agricultural Magazine, gives it a preference over the implement used in England. He says,

> "The most ancient and, I think, best tool, the sickle, is growing much out of use in Great Britain; insomuch, that in the counties of Devon, Somerset, Cornwall, and many parts of the western districts, it is quite obsolete, and not known, having given place to the hook,* and the reason I cannot assign, except it is ease; for, in my opinion, the sickle is the best, on account of its frugality. Some years since, I witnessed a reaping-match between an Irishman with his sickle, and a Worcestershire man with his reap-hook, which turned out in favour of the Worcestershire man, though with a loss, by estimation, of five-sixths of scattered grain. Now, I perceived their different tools occasioned the great difference in loss of grain, the hook, having a sharp, smooth edge, cuts the stems as it is put into the standing corn, before it is gathered into the left hand; while the sickle, having a fine, toothed edge, the teeth inclining towards the handle, does not cut as it is put into the corn. I, however, acknowledge the hook will perform its work with more ease; but if the labourers must have ease, I would recommend the *sickle-hook*, which is toothed from the middle of the hook to the point, and which, in a great measure, prevents that enormous waste of grain which takes place with the other kinds."

The mode of reaping called bagging, or badging, and practised a good deal about London, and part of the west of England, is thus executed:—the left leg being pushed into the standing corn, and the straw inclined with the left hand over the left foot, is then cut close to the bottom with a stroke from the right hand. The increase of straw, where this is valuable, renders this a good method of reaping.

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* It would appear as if the writer reversed the terms sickle and hook, as understood in Ireland, where the Irish implement is called a hook.

Cutting corn with a sickle of some sort, is preferable to mowing it with a scythe, unless the crop stands up well, and time presses. Barley, and oats, however, may be frequently mown with advantage, (see *Hainault Scythe*, and *Scythe;*) but wheat which requires immediate and clean binding, and is too valuable to admit of any irregularities or wastefulness in harvesting, should be reaped.

The mode of reaping differs, in more respects than in the formation of the implement, in Great Britain and Ireland. The British labourer first cuts a small handful for the band, which he deposits, and then (cutting across the entire breadth of the ridge) he lays across the band as many handfuls as will constitute a sheaf, which he himself generally binds. The Irish reaper, being a more social animal, has three or four companions on the same ridge, according to its breadth; one cutting a passage along the furrow, and ledging the several handfuls across it, and the others reaping a breadth of about eighteen inches each, every pair of reapers ledging together, but none of them preparing bands for their fair followers, a piece of gallantry which the British, north and south of the Tweed, invariably discharge for the binders when any attend, though in doing so, they set the stalks of corn together *by the ears*, a mode of union which the Irish ought naturally to understand, but with which, in this instance, they are utterly unacquainted. In Scotland, binders are generally provided, which is a great saving of time to the reaper, but in a much less proportion than in Ireland, where one binder (female) is allowed for two men, supposing the binding to succeed the reaping immediately, which is only the case there with wheat. The binder makes bands, and has quite enough to do.

"To arrange the reapers in the field in the way best suited for despatch, let three be placed upon each ridge, when the breadth is less than eighteen feet, with one man for every six reapers to bind the sheaves and place them upright in the way to be described. Let it be the duty of the centre reaper of each ridge to make also the ropes or bands by cutting, or, when the corn is very short, by pulling a small handful of the corn, twisting it together at the ear-end, and dividing it into two smaller parcels; and let this band be laid down upon the stubble behind him. When the ridge, however, is eighteen feet or more in breadth, there may be four reapers upon each ridge, and then there must be two binders for every three ridges, being one binder for every six reapers as before."*

It will be seen by the foregoing detail of Scotch reaping, that one binder is considered sufficient for six reapers; but in such case the binder has not to make and arrange the bands, nor collect the severed stalks, all which is performed in Ireland by the binder, which accounts for the necessity of increasing the number of operatives there so considerably, and we think so judiciously. Two smart reapers with a fair crop, will give a woman constant occupation in collecting and binding; and surely it is better at a critical season to employ the *men* in severing the corn alone, when active women can discharge the other part of the work equally well, and at a cheaper rate too, and with the additional consideration, that by giving them such employment, the means of supporting their families are enlarged.

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* Low's Elements.

The sickle is spoken of in the book of Deuteronomy; and will probably hold its important rank to the end of time, as an instrument, if not the most generally efficacious, at least indispensable on uneven ground, among obstacles of any kind, and in all cases where corn is matted or lodged.

With all our boasted skill in machinery, no reaping machine of general application has been framed, since the days of Pliny and Palladius. The former alludes to a machine, carried upon two wheels, and impelled by an ox, and "used in the plains of Gaul." But this only severed or rather dragged off the ears, and of course left the straw behind. And Palladius remarked most correctly, and with all the precision of a modern farmer, that "this machine does very well in plain and *smooth* fields, and in places where there is no necessity for straw."

Several attempts have been made in modern times to form reaping and mowing machines. Among the most likely to succeed is that which has been constructed by Mr. Smith,* of Deanston Cotton Works, in Perthshire. We heartily wish perfect success to his ingenuity and perseverance. It is only calculated, however, for a scale of very improved farming, on account of the cost of the implement, (among other considerations,) which is stated in the catalogues of Messrs. Drummond† to be £50.

For the mode of mowing corn and stooking, see *Scythe* and *Wheat.*

RENNET.—The coagulum for making cheese; and prepared from a substance in the stomach of a young calf.

RENTS.—These are so variable, so entirely regulated by circumstances, that nothing precise can be laid down on the subject.

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* The inventor of the subsoil plough.

† Mr. Bell's machine, which acts on the clipping principle, is also recommended by Messrs. Drummond, and at nearly the same price with that of Mr. Smith.

Some landlords are generous to their tenants, and solicitous to render them happy, and comfortable, and thriving, even to their own inconvenience; others are avaricious, exacting, and indifferent to every consideration except that of their own voluptuous indulgences.

"Live and let live" ought to be the ruling maxim of the landlord, as regards the amount of rent; and when he has an enterprising tenant he ought to assist his efforts to the utmost of his ability. Under no circumstances ought he to demand rack-rents, which in Ireland, in a remarkable degree, are expected by *too many* of the land proprietors, who cannot tolerate the notion of reducing rents to an equitable standard, because they themselves have been pleased to affix to their land some ideal value, according to which they have injudiciously regulated their domestic expenditure.

It is not *generally* good for the tenant to have his land *too cheap*; for in this case, when he finds that he can pay his rent with little exertion, he will not improve—he has not the stimulus of necessity to make him. But on the other hand, any tenant in the United Kingdom will be dispirited and discontented if the rents be *excessive*, and such as prevent him from having a *fair* return from the land for his labour and capital. The first person of whom we have heard as a receiver of rent was Pharaoh, and his proportion was one-fifth. "And it shall come to pass in the increase, that you shall give the fifth part unto Pharaoh, and four parts shall be your own for seed of the field, and for your food, and for them of your households, and for food of your little ones."*

A third of the rent in money of the average value of the produce, has long been considered a correct rule, but could only be regarded as such under an ordinary and fixed system of grazing and tillage. When an enterprising and very skilful tenant renders a farm extremely productive by unremitting industry, *the introduction of a new system*, and the judicious application of his capital, he ought not in justice to be charged more rent than his neighbour who occupies a farm of the same size and of similar soil, but who conducts his farming operations in the *jog-trot* style.

This would be directly *taxing* the skilful tenant for the good example which he affords to the less valuable occupiers of the adjacent soil, when it is plain that he ought to be *rewarded* for his pre-eminence among them. The rent, in a word, *can* never exceed—without ruin to the capital or private resources of the tenant—the surplus which remains after defraying the costs of the farm, and the assessments upon the land, and the *reasonable* and *suitable* expenses of the farmer's family, and must be entirely regulated by the quality and *condition* of the soil, fences, buildings, facilities of manure, proximity to market, and various local peculiarities. One circumstance is clear as regards rent; the *rich* farmer will not contract to give more than the value for land; he knows the *power* which his capital gives him in the market; he can select his land, and the larger the scale of the farm which he desires, the greater the probability of his obtaining it on advantageous terms, because he will have few competitors, compared with the *little* farmer and small capitalist who has to contend with a whole host of persons in limited circumstances.

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* Genesis, xlvii. 54.

The truth of this principle is clearly illustrated in Ireland, where it is pushed to an extreme point of practice; for there the man who aspires to half a dozen acres (with perhaps only £10 of capital) competes with a much greater number of applicants, than in the cases of larger farms, and *pays in consequence* a much higher rent in proportion.

In modern times, rents are entirely paid in *money*, without the obligations of supplying poultry, eggs, butter, turf, and spinning flax and wool, which used to keep up rather an unpleasant kind of domestic intercourse between the landlord and his tenant, in Ireland and Scotland. Smith, in his survey of Argyleshire, concludes an enumeration of duties and dues of various kinds, precisely as in Ireland in days not very remote from the present time, with this expression; "in short, so many hundred things are required by the laird, and so many hundred things by the lady, that it is impossible to pay them."

RIBWORT, PLAINTAIN, or RIBGRASS—Is a hardy grass, with long, ribbed leaves, abounding in dry soils, where the surface has not been properly covered with more valuable vegetation, and is said to be less palatable to cattle on such soil, than in rich, moist land where its flavour becomes so good as to render it a favourite with cattle of all kinds, and particularly cows. Still it is an unprofitable species of pasture herbage, and should rather be considered as an unwelcome intruder. As an ingredient in hay, it is considered decidedly so.

RIDGES.—These elevations of the surface are utterly useless on sandy, gravelly, or dry, loamy soil, or indeed on any description of land that is thoroughly drained, except for marking out a field into sub-divisions for the purposes of ploughing and sowing.

These should be as wide and flat as the nature of the soil will permit. The breadth and degree of convexity vary considerably, according to local circumstances and prejudices.

The breadth of ridges in the best agricultural parts of Scotland, is usually 15 or 18 feet. The manner of forming them (the land, if in fallow, being previously levelled by the harrow) is well and accurately described in Low's Elements, under the head "Ploughing."*

When a great dgree of convexity is considered necessary, as in many parts of England, repeated gatherings are given, which the ploughman effects by drawing his first furrow in the centre, then turning his cattle short to the right, and backing up that furrow, and drawing the earth to the centre from the sides.

In fields in which the ridges have been made with a view to their *permanency* of form, and have obtained the desired degree of curved elevation, the ploughman, in the course of the succeeding ploughing, has only to reverse the first arrangement, by making what had been the furrow of the old, the crown of the new ridge, which is termed *crown and furrow ploughing.*

Two ridges are often combined in one. This is done by what is called *casting.* "The furrows of each ridge are laid in one direction, while those of the next adjoining ridges are turned the contrary way; two ridges being always ploughed together."†

Cleaving ridges is thus explained by Mr. Low:—

> "In this case, the plough commences at the open furrow, lays the first slice towards it, and then, returning by the other side of the open furrow, lays the second slice upon the first. When it has reached the centre it stops, and begins with another pair of ridges, and ploughs the half of each pair together in the same manner. In this way the open furrows of the ridges become the centres, and the former centres become the open furrows. The operation of cleaving is of constant occurrence in the summer fallow, and other cleaning processes of tillage. When we wish to level a ridge we cleave it. There are two variations to be noted in the practice of cleaving. Either the two first slices are laid close together, in which case the open furrows of the former ridges become the centres, and the former centres the open furrows; or a certain distance is kept between the two first slices, and so the open furrow is preserved. In this case, each ridge is split into two ridges, and the number of open furrows is doubled."‡

The favourite system in Gloucestershire, and some other parts of England, of forming wide ridges, three or four feet higher in the crown than in the furrows, appears injudicious. A ridge only 15 or 18 feet wide, with the centre only 18 inches higher than the furrow, will afford more fall for water than the others, from their great breadth. Another advantage possessed by the narrower ridge is, that it possesses equalization of depth, and quality of mould, which, in the highly-elevated ones is accumulated to such a depth in the centre that it becomes inert, while the soil on the sides approaching the furrows is gradually more shallow. It is unquestionably better to preserve as much as possible an equal depth of the vegetable earth that has been exposed to the meliorating agencies of the atmosphere and manure. A very high ridge is also under the inconvenience of having the sunny side more luxuriant, and sooner ripe, than the other side less favoured by the sun, or more exposed to wind.* The curvature observable on the ridges of some of the English fields, is often unaccountable. If the land be much inclined, the object in their formation may have been to prevent the washing of the earth into the furrows by heavy rain, and its too rapid flow from the higher to the lower part of the field; but we have observed this curvature on flat land, and where there was not even the Irish apology of a curved fence to cause the aberration from a straight course. It cannot be supposed that the curved line has proceeded from the ploughman's refined conception of "the line of beauty;" and therefore it can only be traced to a local *fashion*, which perhaps *originated* in the first cause assigned. Every scientific mechanic knows that a plough has the least friction in a straight line, and the greatest power of laying the earth or sod over; the friction is not only increased when it moves in a curve, (the back part of the mould-board pressing hard on the one hand, and the coulter pressing on the other,) "but, where the straight line of a plough is applied to the curvature of a ridge, in order to heighten it by gathering, the earth moved by the plough is continually falling back, in spite of the most skilful ploughman."

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* This is probably the best article in that work.

† Encyclopædia Britannica, new edition.

‡ This is illustrated by plates.

The common Irish farmer, who has often a winding ridge, (but only because the side of the field at which he commences happens to be crooked,) and always an extremely narrow one—four feet—cannot assign any good reason for his bad practice, when on perfectly dry land, except that from habit he would not know how to plough if he had not his frequent furrows to direct him in entering his plough. It is true that in proportion to the curvature of the surface will be the portion of it exposed to the atmosphere; but on this he does not reflect, and though this is an advantage in land when in a fallow state, it is much more than counterbalanced by the unsightliness and inconvenience of the ribbed field when it is under grass, as regards the even distribution of manure—especially if liquid—and the processes of irrigation, mowing, and rolling.

RIPPLING.—(See *Flax.*)

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* If the inclination of the land will permit, ridges should run north and south, to allow to each side an equal share of the morning and evening sun.

ROLLER.—This is an *indispensable* implement, whether for levelling and consolidating the surface of land under grass or crops, or of aiding the harrow in breaking down and pulverizing clods on fallows. The want of the roller is among the principal deficiencies in the small farms of Ireland.

There are different kinds of rollers of cast metal, stone, and wood, and of various diameters.

The most desirable is that of hollow metal, either in one or two parts, (the smoothness of which tends to prevent it from collecting earth,) of which the cylinder is five feet long, and the diameter two; in the latter case, as the parts revolve separately, the draught is lighter and easier in the turnings—two horses abreast, and in shafts, should be yoked to it.

In the vicinity of granite stone, rollers of this material, from twelve to sixteen inches diameter, in one or two pieces, are very common, and these are very efficacious, as well as extremely cheap, the cost of one being about £1, with a scraper and frame, while the price of a metal roller ranges from £8 to £12, and that of a complete wooden one from £5 to £10. The wooden ones are either of heavy, solid timber, of as large diameter as a tree will allow, or hollow cylinders three feet in diameter, with a frame somewhat like that of a cart, and a box on the upper part to carry weights in order to sink it in the earth, and to convey away any stones that may be in the course of the machine.

On any but very light soils the wooden roller makes little impression, though for levelling potato or turnip drills, &c., or compressing the earth about newly sown seeds, it is, perhaps, preferable to a heavier implement.

One-horse rollers are useful for purposes of the nature just mentioned; but no farm of *clay soil* should be without a roller of from 16 to 20 cwt.

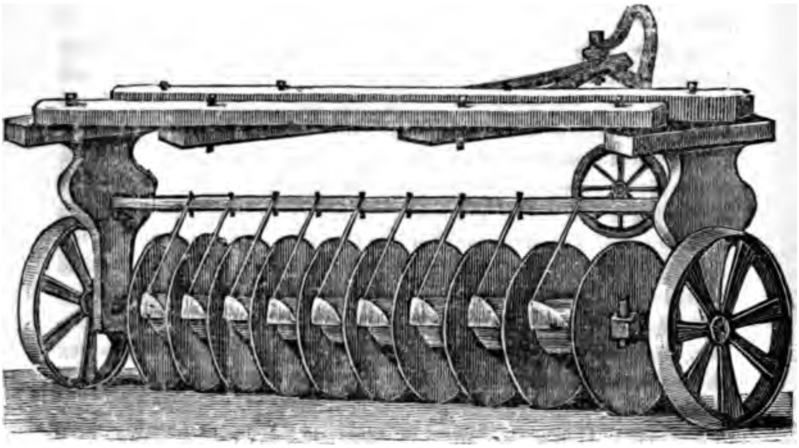
A difference of opinion has existed respecting the relative effects of cylinders of large and small diameters, supposing the rollers of equal weight. The one of larger diameter is obviously more easily drawn.

> "A roller of small diameter will sink deeper than one which is larger, but of the same length and weight; and the advantage gained by the smaller roller in that respect may be ascertained with tolerable certainty. But the sinking of both must vary considerably, according to the nature and state of the soil; and although, when they are of the same weight, we may nearly ascertain how far their difference in dimensions is likely to affect their sinking; yet it would require more accurate observations upon the action of the instrument than any which, so far as I am aware, we at present possess, to determine the absolute depth sunk by either, or the laws which regulate the sinking of two rollers of the same dimensions which differ merely in weight. Taking into view, however, the whole circumstances which seem likely to affect the operation of the large and small roller of the same weight, any

advantage that may be possessed by the latter in efficacy, appears not to be very considerable; and within certain limits, it is probable that it will be more than counterbalanced by the advantage in the ease with which the large roller is drawn."*

The annexed plate represents a peculiar sort of roller used by Mr. Fetherstone in reclaiming bog, (see *Bogs.*)

"This is made of iron, with plates of thin iron, six inches deep, set at five inches apart, at right angles to the cylinder, and wheels *which are taken off* when the roller is used. This passing backwards and forwards over the roughly turned-up sods of turf, reduces them, and as it were minces them so fine that no large clod is left."†



There is a very effective implement, invented by Mr. Crosskills, called the clod-breaking roller, somewhat on the same principle, having a series of distinct upright parallel and independent cylinders, so as to prevent clogging.

ROLLING.—This operation (which, however, should not be attempted when the land is so wet as to *clog* the roller) is highly conducive to the vegetation of crops—*especially wheat*—by reducing the rough parts of the surface to a mouldered state, and thus earthing up the stems of the plants while it renders the surface level and compact. Its use in closely compressing the particles of earth on light, sandy soil, by excluding cold wind or a parching sun from the roots of young corn, is extremely great, and should be repeatedly performed to grain crops in the spring months, as long as it can be continued without breaking the stems. A heavy roller is essential to the success of corn in tenacious soils, by closing up the fissures which dry weather occasions by evaporating moisture, and is useful for breaking down clods on fallows, in aid of the harrow, which then more easily separates them, and disengages couch-grass and other weeds, which it brings to the surface.

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* See Quarterly Journal of Agriculture, No. 6, in which the case is mathematically discussed.

† Irish Farmer's Magazine.

If the roller be heavy—as it ought to be in order to be really useful—and requires two horses, they should not be in line, unless the roller be constructed with only single shafts; independently of the disadvantageous application of power in this case, the trampling of eight legs instead of four in the same track will make, under particular circumstances, impressions which the roller will not so readily remove as if only the footsteps of a single horse in the track were imbedded. This is, of course, perfectly immaterial in preparing fallows for the succeeding plough and harrow, though it may be of some *weight* in the case of sown crops, where the surface is not to be stirred again.

On grass lands heavy rolling is also highly efficacious, particularly if the surface has been rendered uneven by the treading of cattle or the labours of the mole and ant. On dry, absorbent land when under grass, rolling will be most useful after rain, if not so immoderate as to cause injury from the feet of the horses during the process; and the earlier in the morning the better, to destroy slugs and other vermin. Meadows are served by rolling immediately after the hay is removed, in order to press the seeds that had been diffused over the surface into the earth, and thus conduce to their vegetation. The usual way of moving with the roller, is to begin at one end of the field and to leave at each bouting an interval precisely of the breadth of the roller, (in order to allow a sufficient sweep for the roller in each turning, without injuring the headrigg by tearing it, or distressing the horses,) and alternately to roll these intervening portions. When the land is in ridges the rolling should be across them.

RYE—Is much more hardy, but incalculably less valuable in every respect than wheat. With us it is very little used as an article of food compared with wheat and oats, though in the north of Europe and in Flanders it forms a principal article of human subsistence, but generally mixed with wheat, and sometimes with some barley also.

The preparation and culture of rye are essentially the same as for wheat; but the same quality of soil is not equally suited to each. Rye will grow well in sandy land where wheat would fail; and it is on the light soils of Flanders that it is sown, succeeded by a crop of turnips immediately after it is removed. A mixture of wheat and rye are often sown there together, as is perhaps still usual in the north of England, where it is called *meslin*, but this is considered generally a bad practice, for though the grains will probably ripen together, they *may* not. Besides, if the land will produce wheat, it is not judicious to combine an inferior grain with it.

Mr. Radcliff, in his report of the Agriculture of Flanders, attaches great importance to the culture of rye, both for bread and for distillation, and with his usual perspicuity he thus sums up its valuable qualities:

> "It flourishes on a poor soil, ripens early, produces abundantly, and sells high; makes wholesome bread, is most valuable in the distilleries, and, by its refuse, returns to the soil, through the medium of stall-fed cattle, the means of still more extended fertility."

Its price in Flanders compared with wheat is stated to be as four to five, and the produce about four and a half quarters per English acre.

> "In Ireland there are various soils suited to its culture; it not only thrives upon sand, but flourishes upon mountains; near the summit of a pretty high one in the county of Wicklow, it has produced at the rate of nine barrels, of twenty stone each, to the plantion acre; and yet look back to the weekly statement of the Dublin market for years, and you will find this valuable grain scarcely ever appearing in its returns. It seems to be admitted, that there is no arable land in Ireland which is not capable of producing wheat or rye; to what profit might not the knowledge of the fact, and the application of it, be converted, were the Flemish practice adopted, as to the culture of this latter grain, and the uses to which it may be made subservient."

Mr. Radcliff concludes with an important remark on its ripening.

> "In the month of June, 1817, in France, and in Flanders also, which has nearer affinity to our climates, the rye-harvest so long preceding that of any other grain, critically met the difficulties of the moment, and was cheered as the harbinger of health and plenty."

The quantity of seed required for the acre is less than two bushels.

RYE-GRASS or RAY-GRASS.—(See *Grasses.*)—The etymology of this word has puzzled some of those who delight in perplexing themselves unnecessarily. It is not so named from its resemblance to rye, to which it has no resemblance, nor from being introduced by a botanist, *Ray;* but, according to the editor of Evans and Ruffy's Farmer's Journal, from the operation of the sieve called ryeing or raying. Most probably the first person who saved it was questioned as to how he procured the seed. "Oh, (says he,) I rayed it." "Did you? (says his neighbour.) Then I'll ray some." Hence the name ray-grass.

SAINFOIN—A tap-rooted perennial plant, introduced from

France into England in the middle of the sixteenth century. Sir John Sinclair said of sainfoin that it is "one of the most valuable herbage plants we owe to the bounty of Providence." It is, however, only suited to sandy, chalky, or other dry and calcareous soil. It strikes down to a great depth in chalky rocks, and finds nourishment through the fissures. It would perish on land with a cold, wet subsoil.

"It has been cultivated in England in the chalky districts, and its peculiar value is, that it may be grown on soils unfit for being constantly under tillage, and which would yield little under grass." Its nature, qualities, and treatment, are quite similar with those of lucerne. (See *Lucerne.*)

SALT.—We are not disposed to attach any degree of importance to this mineral as an element of fertility, though as a condiment in the food of cattle of all kinds, it is unquestionably of great value. Salt (muriate of soda) is very extensively combined with animal and vegetable substances, and, therefore, in all cases in which there may be a natural deficiency of this ingredient, it may be useful to supply it artificially. But the deficiency should first be ascertained, and even then it is uncertain in what proportions, or in what combinations salt should be resorted to. Surprising statements have been made of the efficacy of salt; for example, Mr. Henry Kemp, in an address to the public on his wonderful discovery of *decomposed* salt, for the purposes of manure, gravely states that a ton of salt will afford a sufficient quantity of soda for manuring three statute acres, and that land which with a good dressing of dung will produce twenty or more bushels of wheat to the imperial acre, will, with the aid of ten shillings' worth of decomposed salt, yield from 35 to 40 bushels!*

The practical farmer pays no attention to such an assertion, however credible it may appear to the theorist himself, who is obliging enough to say that he will let the world into the secret of his process of decomposing salt (which in its common state he considers inefficacious as manure) for a *consideration.* We doubt that this peculiar preparation is a whit more useful than that form of salt which he himself admits to be without efficacy.

Salt in excess destroys vegetation. This is evident on looking at the sea banks, which are constantly receiving the spray of the sea.

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* This reminds one of the story of Lord Kaimes and his steward. "John," said his lordship, "this is the proudest day of my life, for I have made a most important discovery." "What is it, my lord?" said John, not at all astonished at the announcement. "I have this day discovered, John, a manure so powerful that the full of one of my waistcoat-pockets will serve for an acre." "Ay, ay," said John; "then by my troth, my lord, it will not be long till your lordship puts the crop in the other!"

Salt marshes are undoubtedly wholesome for cattle, for a short period; by their cleansing properties they relieve animals whose digestive organs have been impaired from those ailments which proceed from the derangement of the principal animal functions, and restore them to a healthy condition; and the pasturage subjected to the occasional and moderate influence of saline matter, by the application of sea-weed, sea-sand, or common salt sown on the land, is highly relished by all classes of cattle. The salt *licks* in North America are regularly frequented by the native deer as well as the domesticated cattle, which find health and luxury in their saline draughts.

Salt extracted from the earths, and from vegetable or animal substances, are considered more conducive to the fertility of the soil, as possessing more of the vegetative principle, than in the corrosive state.* For instance, the salts obtained from burnt peat or weeds, have no tendency, even when applied in excessive quantities, to produce sterility. This arises from their combination with substances which deprive the salts of their corrosive qualities.

There are various modes of applying salt to land, viz. by strewing it on it when in grass, or in the fallow state, as a top-dressing for growing corn crops, and mixing it with compost or farm-yard manure. Coarse, sour herbage, rejected or disliked by cattle, will be rendered grateful to their taste by the application of a sufficient quantity of salt; but this must depend on the quality of the land, and the texture of the grass, and can only be ascertained critically by experience. A heavy dressing may be necessary in one case, and yet destructive in another. According to the opinion of the late ingenious Dr. Darwin, salt is useful as a means of stimulating the absorbent vessels of plants, to extract nourishment from the soil and atmosphere. But if administered in excess it may so strongly irritate those absorbent vessels as to deprive them of power altogether.

When salt is applied to spring fallows, one mode of treatment is to scatter about ten bushels per acre, after the seed is harrowed down. Others, however, recommend the application, either immediately or a few weeks before sowing. This latter caution is useful if a heavy dose is to be administered for the destruction of weeds or grubs, lest the germination of the corn should be injured or destroyed.

Double the above quantity should be used on grass-lands previously to breaking up, or to an autumnal fallow intended for sowing in the ensuing spring.

Mr. Hollinshead† advises in this case, another application of about ten bushels in spring, after the seed is sown; "for this," he says, "by meliorating the soil, destroying weeds and insects, and attracting moisture, will produce an abundant crop, and afterwards by ten bushels annually, these lands will ever afterwards produce abundantly." But lime would be incalculably more beneficial.

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* The salt which is *slowly* and *gradually* yielded to the earth from an application of sea-weed, first perfectly dried by the sun, is a remarkable instance of this. The salt of fresh weed rapidly dissolves, and sinks into the earth; in the other case, *it is slowly evaporated.*

† Evans and Ruffy's Farmer's Journal.

The best way is to incorporate it with farm-yard composts, in moderate portions. In this way it cannot over-stimulate the land, and is decidedly serviceable to the compost.

It has been used as a top-dressing for corn crops also; with caution it may be useful. It will at least tend to destroy grubs, and to convert those agents of destruction themselves into manuring substances, while it tends to improve the quality of the grain, and to increase its produce.

Soils containing too much ferruginous matter—oxide or carbonate of iron—may be greatly improved by a chemical combination with salt, the deleterious substances being thereby converted into elements of vegetation.

For *dairy* purposes, and the curing of meat, the Dutch are remarkably attentive to the manufacture of salt, which they divide into three sorts; that for butter (somewhat smaller than our common salt) is evaporated in 24 hours; the other two kinds are evaporated in three, four, or five days. The last kind is generally used by them for curing meat, and is in large crystals. To the superior quality of the first kind of salt, the great excellence of the Dutch butter (so free from the acrid taste, which indifferent salt combined with muriate or sulphate of magnesia occasions) is attributed by the British butter merchants.

SCAB. See *Sheep*.

SCARIFIER—A tillage implement for stirring and loosening the soil, without bringing up a fresh surface. Under the same head may be included the grubber, the cultivator, and the scuffler, all of which act on the combined principles of plough and harrow at the same time.

Some of these implements have wheels, by the raising or lowering of which the tines or prongs may be made to sink more or less into the earth.

The Scotch scarifier

> "Consists of two strong rectangular frames, the one including the other, and 9 bars mortised into the inner one, with 11 coulters or prongs, with triangular sharp-edged dipping feet, 4 cast-iron wheels, and 2 handles. All the cutters are fixed in these bars, except 2, which are placed in the side-beams of the outer frame, and may be set to go more or less deep by means of pins and wedges. It

works as deep as the plough has gone, and by the reclined position of the coulters brings to the surface all the weed roots that lurk in the soil. Beans and peas have been sown in spring on the winter furrow, after being stirred by the grubber; and barley also after turnips, without any ploughing at all. This implement is made of different sizes, and may be worked either by four or by two horses and one man."

Finlayson's improved harrow or grubber, and Kirkwood's of different sizes, are the most modern and improved.

SCYTHE.—This implement for mowing grass has been latterly much used for cutting grain crops, and with great success, when it has been properly mounted with a rake or cradle, and put into expert hands.

The cradle-scythe is described in an article "On Reaping with the Scythe" in No. 21 Quarterly Journal of Agriculture, which we earnestly recommend to the careful perusal of every *literary* farmer, as it contains all the information which it seems possible to collect on the entire subject of which it treats, in a clear and masterly style.

We venture to extract a few essential points from that interesting essay.

"Every band may be arranged in this manner:—two scythe-men to reap; a person, generally a woman, to follow each scythe, to make bands and take up the corn, and place it in the bands in bundles ready to be bound up; a bandster, always a man, follows the women, and binds the sheaves; the two bandsters set up the corn together into stooks; a woman follows the whole with a large rake, and clears the ground of any loose corn, and brings the rakings to the bandsters, to be bound up in the sheaves or by themselves."

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"Suppose, then, that two mowers and their people form a band, and suppose there are three bands engaged at harvest, they should arrange themselves by these circumstances. Sixty yards is as much space of corn as a scythe can cut easily at one sharpening, and that distance is about as far as most men can cut at a breath. Twelve ridges of five yards each, or ten ridges of six yards, will thus mark the breadth to be cut at once. Let the foremost or leading band start first to the cutting of the sixty yards, whilst the other are preparing to follow; let them then sharpen their scythes, and proceed forward other sixty yards; and while they are doing so, let the middle band commence, and they will cut their sixty yards in the same time in which the foremost band will have cut their second sixty yards; let both bands then sharpen their scythes at the same time. When both are ready to start again, let them continue to cut onwards, each its sixty yards, while the last band commences its first sixty yards, which, when accomplished, all the bands will be in their respective places, which they must continue to occupy till the breadth of ground which they occupy shall have been reaped of its corn along the whole field, provided there is no extraordinary interruption from the peculiar state of the corn. In this manner, the band which occupies the advanced position falls back, and takes up the space which has just been abandoned by the band immediately behind it. No interference can thus take place among the different bands, while the one serves as a check upon the other, both in the marking of the time, and the quantity of corn reaped by each. A band losing time in cutting out its sixty yards, will cause delay by preventing the band in front of it entering its proper ground. A band losing ground, by lessening the width of the stroke of the scythe, will deprive the one before it of its legitimate width of stroke. Should laid corn or a stronger part of the crop interfere with one band more than another, it is requisite that the band before or behind it, should advance or fall back the breadth of one ridge or more if necessary, in order to equalize the time among them."

"To ensure good work in reaping with the scythe, it is requisite to preserve a keen edge on the blade, and always keep the heel of the scythe close to the ground."

"The rake attached to the scythe requires a position differing with the nature of the crop. When the crop is an average one, it should be placed in a line with the back of the blade of the scythe; when a strong one, it should be kept within the blade; and when a thin one, it should be projected a little beyond the blade."

Drummond's iron-handled scythe is considered in Scotland very effective. A good mower will cut down with it from an acre and a half to two acres in the day, and with this scythe he can either cut *out* from the standing corn when *upright*, or cut *in*, as many deem the better way at all times.*

The common grass-scythe will *cut* oats, and barley also, very well when upright; but the mower will perceive his inability to lay down evenly, and at right angles with the standing corn—for the convenience of the binders—a heavy crop of wheat with this scythe, even if furnished with a bow.

"But as the object of all discussion on this matter is to recommend this expeditious and economical mode of reaping his crops to the farmer, his best plan is to try the various methods of mounting the scythe, and adhere to that which he finds best suited to his purpose. We shall conclude with one remark, on permitting oats to stand till too ripe, in consequence of rainy weather. When using the scythe, we should not hesitate to cut down oats in the heaviest rain, and bind them up, rather than allow them to stand till too ripe, for a sheaf cut with the scythe is so pervious to the air, that it will dry in a few days of fair weather, if the hood-sheaves are kept off. So is not the case with barley and wheat, for they both spring very readily, if put together damp, particularly in warm weather."†

The *Hainault* scythe—the favourite Belgian implement for severing corn—is thus described in the Outlines of Flemish Husbandry:—

"It is a very useful instrument, and in the hands of an experienced person will cut a third more corn, in the same time, than can be done with the reaping-hook. It is a short scythe, of which the blade is broad and about twenty inches long. The handle is about the same length, and fixed so as to form an acute angle with the blade, when in the act of cutting; it is bent outward at the end where it is held, at an angle of about 120°, and is there shaped like the stout handle of a knife or turning tool. It should be so constructed, that, when the blade lies flat on the ground, the man's hand is nearly perpendicularly over the centre of the curve of the blade, so that he can swing the instrument, by a motion of the wrist, without stooping. A leathern strap, doubled and nailed on the handle, in which he puts the fore-finger, prevents its slipping from his grasp. In the left hand he holds a light stick three or four feet long, having an iron hook fixed at the end, bent into a semicircle of about eight inches diameter. With this hook he collects the standing corn, and lays it towards the left, while the right hand cuts it close to the ground. The cut corn leans against that which is standing; and when as much has been cut as will make half a sheaf, the workman turns half round, and hooking up part of what is cut with as much of what is standing, he cuts and rolls up the whole in the form of a sheaf, using his leg and foot to keep it in the bend of the blade. The legs are protected by pieces of strong leather over the shins. Thus it is laid down for the binders. Those who are accustomed to the method of fagging in use in Middlesex, Surrey, and the neighbourhood, where straw is valuable, will readily see that this scythe is only an improved fagging-hook, allowing the reaper to stand upright at his work, and saving that fatigue of the back which is the chief inconvenience of fagging. For women, to whom stooping is not so laborious, the fagging-hook may perhaps do the work as conveniently. But in Flanders women only tie up the sheaves, and seldom reap. This instrument has been often recommended for use in England; and we have ourselves made presents of it to reapers who cut by the acre. Very few had the patience to become dexterous in the use of it, and after a few trials returned to the old fagging-hook, although it was evident that it would, if properly managed, cut one-third more corn, at least, in the same time. It is, however, inferior in expedition to the cradle-scythe in the hands of a skilful mower. This last is also used in Flanders, but not so commonly as the foregoing."

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* The public are much indebted to the Rev. James Farquharson of Alford, for his ingenious improvements on the cradle-scythe, and his valuable communications to the journal here referred to.

† By the editor of the Quarterly Journal of Agriculture, No. 27.

See *Sickle* and *Reaping*.

SEA-WARE, or SEA-WEED, (*Fucus.*)—This great material of fertilization provided by the bounty of Providence for the inhabitants of our sea-coasts, has many provincial designations, such as "wrack," and "wore," or "ore," (which latter terms are evidently corruptions of the word ware,) "seatang," &c. After storms it is disengaged from its native submarine beds, and cast upon the shore, on which it is eagerly collected by the peasantry, who flock there with light cars and prongs, in order to obtain their share of the treasure, while the state of the tide permits them to work. Sea-ware, besides the large portion of salt which it contains, is of a very fat or oily nature, which renders it highly fertilizing as a manure.

There are different modes of applying it.

1. Spreading it fresh from the water *thinly* on grass-lands* as a top-dressing, or thickly on stubbles which are to be immediately ploughed up for potatoes or beans.

2. Laying it on a substratum of sand or earth, with or without long dung to form a compost.

3. Scattering it on potato drills or beds, before the buds appear, either fresh or in a dry state, and covering it from the furrows with the plough or shovel.

The first method is practicable only in the immediate vicinity of the sea-beach, and in this way it is applied with the greatest efficacy and economy, as none of the salts or juices are lost by previous evaporation, and the stubbles become converted into manure, through the fermenting process which soon succeeds its application to the soil.

The second mode is that usually pursued by those who are more distant from the beach, but within a range of two or three miles. The compost is excellent for potatoes, (if planted early,) turnips, beet-root, cabbages, &c. By being allowed to ferment, it produces a great mass of living animals, which add value to the combined properties of this manure.

By the last method, a supply is obtained principally by small farmers or cottiers living in the interior, who plant their crop in the usual season, whether the sea-ware be on the coast or not, on the *speculation* of obtaining a supply before the potatoes are over ground. They are pretty sure of obtaining it in due time, at the rate of four or five shillings per cart-load from the poor inhabitants of the coast, who are themselves without land in sufficient quantities to require all that their industry may accumulate, and who dry it like hay, in spring, for sale to the distant farmers. This is used at the rate of two heaped cart-loads to the rood, scattered thinly over the drills or beds, but never in contact with the bud, and covered with a little earth from the furrows. On the first dampness of weather, this weed softens or *gives*, as it is termed, and yields its essential qualities to the earth. Our own experience is corroborated by a writer in a very useful periodical, who says,

> "In the dried state it possesses all its original value as a manure, and the reduced weight or bulk will have equal effect, and prove more lasting in the soil. I attribute the *transient* effects of fresh weed to the *rapidity* with which it dissolves in the soil. * * * * I have reason to think that potatoes raised with this manure would be of better quality than from the fresh weed."†

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* Or, according to Professor Low, on any growing crops (to which we, however, have never seen it applied except to potatoes). *before* they reach the surface.

† Irish Farmer's Magazine, No. 68.

This is not a disadvantageous mode of using sea-ware, as there is little except water lost by the process of drying, and to those who have no other means of creating the necessary pabulum for the crop of potatoes on which their existence mainly depends, it is in this portable form truly valuable. One crop of corn may always be expected after potatoes, turnips, or beans, when the supply of sea-ware has not been too scant. The parts of the baronies of Forth and Bargie, in the county of Wexford, which are adjacent to the sea, yield enormous crops of potatoes and beans, from the abundant supply of sea-weed which they obtain. The liquid which flows from this substance when dissolving (and putrefaction rapidly takes place) is rank and penetrating. If the weed be laid thickly on a high heap of loose earth or dung, its juices soon permeate though the whole mass, even to its foundation, and renders it black and putrid. As sea-ware has the property of making land cohesive, it is applied with most effect to light soils.

There is a peculiar species—*Zostera marina*—resembling grass, which is inferior for manure, as it is very deficient in *fatness*, and so little disposed to putrify and dissolve, even when ploughed into the soil, that it is much used by the peasantry on those parts of the coast where it is found, as temporary thatch for sheds and potato-pits—as preservatives against frost, and also by upholsterers as a cheap substitute for hair. When perfectly purified from salt by washing and drying, it is, no doubt, for various purposes, very useful. Many people use it in their mattresses for sleeping on; and, as it is especially avoided by fleas and all insects, as a place of colonization, it is on this account, if on no other, very eligible for this purpose.

It is unquestionably better than straw for a bed, or for stuffing chairs or sofas, but inferior to hair from its want of elasticity, and its tendency to become hard and lumpish. This is to be regretted, for the trade of collecting and preparing this species of sea-weed for the upholsterer, would give very considerable occupation to the inhabitants of Great Britain and Ireland, and the adjacent islands. It would make excellent beds for the humbler classes, if merely shaken and re-made frequently like straw, and not sowed up in any kind of envelope.

SHEEP.—This gentle and interesting animal, which constituted so considerable a portion of the wealth, and occupied so much of the individual attention of the patriarchs, and had its existence almost contemporaneously with man, serves a great variety of purposes. It supplies us with food and clothing; every lock of wool provides employment and support to a great variety of artisans and tradesmen, and furnishes a considerable article of commerce in all parts of the world. Each year this animal yields a new fleece, and gives renewed opportunity to man, of extracting a livelihood by means of the particular branch of the wool trade in which he is engaged. Indeed so much and such varied occupation does the fleece of sheep afford to tradesmen, that the draper's company originally intended to assume this quaint motto—"no ram, no lamb; no lamb, no sheep; no sheep, no wool; no wool, no woolman; no woolman, no spinner; no spinner, no weaver; no weaver, no cloth; no cloth, no clothier; no clothier, no cloth-worker, fuller, tucker, shearman, or *draper*."

Almost every one appreciates the luxury in a greater or lesser degree which good mutton affords to his palate. Nor is milk or cheese the least excellent of the sheep's products. The superfluous fat affords us the means at night of reading such excellent books—as for example, this very Cyclopædia—of working with the needle, or discharging and enjoying the numberless avocations of domestic and social life. Another part of this valuable animal gives us an ingredient for making soap, without which we could hardly shave or show clean hands and faces on Sundays; and the horns of the male and of those peculiar species of female sheep which have them, are useful to the button-maker. Oil is extracted from the trotters. The skin is converted into parchment, and leather for gloves and bookbindings, besides its uses in forming the raw material of legal instruments, and for exciting our courage—if we happen to have any—in case of a warlike invasion. The poor, timid sheep, which feels an agony of fright at any hostile manifestation or unwonted sound, little dreams that the skin in which it so often trembles may be at its death converted into an inspiriting instrument of martial music. The bones are either convertible into elements of manure, or into ingredients of ornamental chimney-pieces and cornices; even the dung is useful for dyeing woollen-cloths. There are many distinct breeds and crosses. Like that of the ox, the age of the horned sheep (all the primitive breed probably had horns, as may be inferred from many passages in the Old Testament) may be ascertained, though with equal or greater uncertainty, by the horns, and is reckoned from the first time of shearing, though this may not take place until fifteen or sixteen months after the birth. Where horns are looked to for the evidence of age in a sheep, the uncertainty arises, with respect to ewes, from the fact of their having been mothers at a very early age or not; for in the former case they will throw out a ring a year sooner than if prevented from breeding. The general criterion for ascertaining the age with precision, until five years, is the mouth. A shearling has two broad teeth before; a two-year-old has four, a three-year-old, six, four-year-old, eight. The teeth will remain sound for two or three years afterwards; but after the age of four or five, though experience and general appearance will enable a judge to give a good guess, he *cannot know* the age with any degree of precision.

"The teeth of the sheep are the same in number as in the mouth of the ox. There are eight incisor or cutting teeth in the fore part of the lower jaw, and six molars in each jaw above and below, and on either side. The incisors are more admirably formed for the purpose of grazing than in the ox. The sheep bites closer than the ox; he was designed to live where the other would starve; he was designed in many places to follow the other, and to gather sufficient nourishment where the ox would be unable to crop a single blade. Two purposes are answered by this; all the nutriment that the land produces is gathered from it, and the pasture is made to produce more herbage than by any other means it could be forced to do. The sheep by his close bite not only loosens the roots of the grass, and disposes them to spread, but by cutting off the short suckers and spoutings—a wise provision of nature—causes the plant to threw out fresh, and more numerous, and stronger ones, and thus improves and increases the value of the crop. Nothing will more expeditiously or effectually make a thick, permanent pasture than its being occasionally and closely eaten down by sheep."*

The male is called a ram or tup, from the time of his weaning; and until he is shorn he is called by a variety of names, a hog, a hogget, a hoggrel, a lamb-hog, a tup-hog, and if incapacitated from breeding, a wether-hog. After shearing, he is called a shearling or shearing, a shear-hog, a diamond or dinmount-ram, or tup; after the second shearing, a two-shear ram, wether, &c.; after the third shearing, a three-shear ram, &c.†

At the lambing period, care should be taken to have a proper enclosure, else the lambs may be dropped into wet ditches, or hurt by thorns, briers, stones, &c.

Lambs should never be stinted in their natural supply of milk; if during the period of suckling, the mothers be milked for cheese-making or any other purposes, the lambs proportionably lose their vigorous condition.

The males should be incapacitated for breed, in about a fortnight after their birth; but general weaning should not take effect until the lambs are three or four months old.

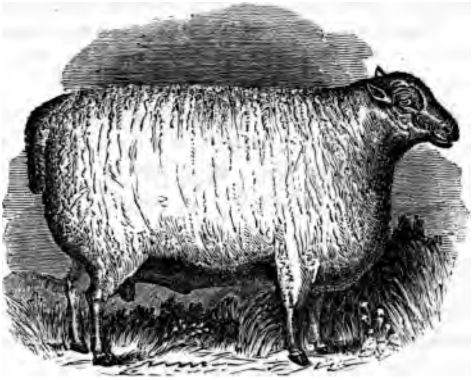
Professor Low enumerates no fewer than *ten* principal breeds:—1, the Zetland sheep; 2, the dun-wooled sheep; 3, the black-faced heath sheep; 4, the moorland sheep of Devonshire; 5, the Cheviot sheep; 6, the horned varieties of fine-wooled sheep of Norfolk, Wiltshire, and Dorset; 7, the Ryeland sheep; 8, the South Down sheep; 9, the Merino sheep; 10, the Devonshire notts, the Romney-marsh sheep, the old Lincolnshire, Teeswater, and old Leicester; the new Leicester and improved Teeswater sheep.

The observations here shall be confined to three or four kinds, because these are respectively the best suited to the varieties of climate and pasture in the British islands.

* Library of Useful Knowledge.

† Ibidem.

THE LEICESTER SHEEP.



THE NEW LEICESTER, whose symmetry and beauty are so pre-eminent, are of the long-wooled breed, and in rich, lowland pasture, are unquestionably the most profitable, as they arrive at early maturity, fatten to a great weight, and are easily restrained within the proper boundaries. Joseph Allom of Clifton—originally a cow-boy—was the first person who improved the old coarse-wooled Leicester sheep, which was long in the carcase and large-boned, in the midland counties of England; and afterwards Mr. Bakewell, of Dishley, in the county of Leicester, by means of Allom's improved stock, brought nearly to perfection this new Leicester breed, which is sometimes called, from the name of Mr. Bakewell's farm, the *Dishley* breed.

It was the opinion of Mr. Marshall, the eminent agricultural writer, that the improvement had been effected by selecting individuals of *kindred* breeds from the several varieties of long-wooled sheep, with which Mr. Bakewell was surrounded on almost every side, and by breeding *in and in* with this selection, solicitously seizing the superior accidental varieties produced, associating these varieties, and still continuing to select with judgment the superior specimens. The description of this breed is thus accurately given by Mr. Marshall:*—

"The head is long, small, and hornless, with ears somewhat long, and standing backward, and with the nose shooting forward. The neck thin, and clean towards the head; but taking a conical form, standing low and enlarging every way at the base; the fore-end altogether short. The bosom broad, with the shoulders, ribs, and chine extraordinarily full: the loin broad and the back level: the haunches comparatively full toward the hips, but light downwards, being altogether small in proportion to the fore-parts. The legs, at present, of a moderate length, with the bone extremely fine: the bone throughout remarkably light. The carcase, when fully fat takes a remarkable form, much wider than it is deep, and almost as broad as it is long: full on the shoulders, widest on the ribs, narrowing with a regular curve towards the tail, approaching the form of the turtle nearer perhaps than any other animal. The pelt is thin, and the tail small: the wool is shorter than long wools in general, but much longer than the middle wools: the ordinary length of staple, five to seven inches, varying much in fineness and weight."

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* Encyclopædia Britannica.

The ram should have a large, long body, a broad forehead, round and well rising, large eyes, and straight, and short nostrils. Sometimes he is cloven along the chine like a sheep very fat on the rump; and this peculiarity is, or at least used to be, considered an evidence of high blood.

These sheep, when between two and three years old, have had four inches of fat upon the ribs; they are not, however, the largest; some of the old Leicester, the Teeswater, the Cotswold, which are greatly prized in South Wales, and perhaps some of the old coarse and slow fattening sheep, have attained a much larger weight, *but not at the same early age;* they have not the same aptitude for feeding, nor will any other breed whatever, on reasonably good pasture, or artificial food, return so much meat, which to persons of fastidious palate is, in truth, often too luscious, and is wasteful in private families. The difference in the quality and flavour of mutton is very great, some being coarse and dry, with little or no gravy, and others, in different degrees, plump and well flavoured, and full of light-coloured or red gravy, or a mixture of both. Almost every breed crossed* by them has been improved by the infusion of their blood; and this circumstance has stamped their character for excellence beyond all other sheep both at home and in France, where they were first imported in 1833.

"The new Leicesters, however, are not without their faults. They are not, even at the present day, so prolific as most other breeds. This was too much overlooked in the time of Bakewell and his immediate followers. Their object was to produce a lamb that could be forced on so as to be ready, at the earliest possible period, for the purposes of breeding or of slaughter, and therefore the production of twins was not only unsought after, but was regarded as an evil. It was considered that, during the period of gestation, few ewes would be able to bring to their full fœtal growth two such lambs as the Leicestershire breeders desired to have. The fact, also, which, if they had seriously thought of the matter, must have appeared to be unavoidable, too soon began to be evident, viz., that when the energies of the system were systematically directed to one point—the accumulation of flesh and fat as early and to as great an extent as possible—there must be a deficiency in some one or other point; and the Leicester tups were not such certain fecundators; ewes were not so well disposed for impregnation; and the secretion of milk was not so abundant as in other breeds. When, however, the contest for the highest character as a tup-breeder, and the highest price for the letting of the

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* The first produce of the Leicester and Cheviots is good, but it is not prudent to continue the crossing.

tups, was somewhat passed over, and the Leicesters were submitted to the usual routine of sheep husbandry, they became better breeders and better nurses."*

The average of the wool is six pounds or seven pounds, and though other long-wooled sheep yield heavier fleeces, the texture is coarser, and does not compensate for the inferiority of quality by the increase of quantity.

But to return to Mr. Bakewell. The sums which he received for his rams at different periods were prodigious. It appears† that in 1780 he let several rams at ten guineas each; and from that period to 1786, he let two-thirds of one ram (reserving one-third of the usual number of ewes for himself) to two principal breeders for a hundred guineas each; the entire services of the ram being valued at 300 guineas. He afterwards received in one year 1200 guineas for the services of three rams, (brothers,) and for his whole letting of rams in 1789, he obtained 3000 guineas! During the spirit of contention some of his ewes brought £50 each.

The Messrs. Culley in the north of England followed the example of Mr. Bakewell in the midland counties, and completely established the character of the Leicesters.

A young ram may easily serve eighty ewes in the season, but fifty or sixty are considered sufficient for an aged one.

One of these Leicester rams, eighteen years ago, bred in Warwickshire, by Mr. Johnson, of Samborn Warren, near Alcester, was so prolific as to have had in two successive years 250 lambs. First year, 150; second year, 100. In consequence of his becoming grossly fat and unprolific in the third year, he was killed; his weight was as follows: Wool, 10lbs.; skin, 20lbs.; fat, 29lbs.; head and pluck, 10lbs.; carcass, 248lbs.—62lbs. per qr.

The ram lambs of high breed, as may be supposed, are pushed forward as much as possible by being left with the ewes until July or August, and fed on the second growth of clover, and young clover on stubbles; after this, on turnips spread on dry grass fields, and under the tuition of a few experienced sheep who may teach the youngsters how to eat them. In winter (but the less artificial food the better) if they cannot stand out, or have insufficient pasture, they get turnips and hay, with a small portion of bruised oats; and in spring, they should have the earliest possible bite of clover with their winter food, until there is sufficient pasture.

The ewe lambs of this most valuable breed on being weaned should be put also on good pasture until November, if the season allows, and then have hay and turnips; they should not be admitted to the ram in the first autumn.

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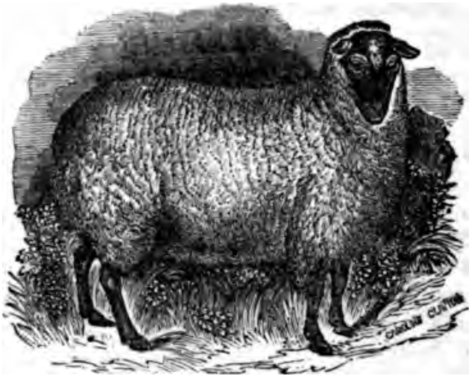
* Library of Useful Knowledge.

† Encyclopædia Britannica.

THE SOUTH DOWN SHEEP.



The South Down.—These have been so long known on the chalky lands of Sussex, as to have been supposed natives of that county; but the fact is, that they have not been at any time confined to that part of England, but have been found on almost all the dry downs of that country. They are of the middle-wooled breed:

> "The South Down, Norfolk, Dorset, Ryeland, Cheviot, and other fleeces occupy an intermediate station between the short wools of Spain and Germany, and the long wools of Leicester and Lincoln; they are in fact the old English *short* wools materially diminished in quantity by the various crosses between the old short and long-wooled breeds which are multiplying in many parts of the kingdom."*

The dusky or sometimes black hue of the South Downs, not only proves the original colour of the sheep, and perhaps of all sheep; but the later period at which it was systematically tried to get rid of this dingy hue. In almost every flock, notwithstanding the great care which is now taken to prevent it, several parti-coloured lambs will be dropped, some with large black spots, some with half black, and some entirely black. A writer in the Annals of Agriculture states, "that he has frequently had twelve or fourteen perfectly black lambs, although he never kept a black ram or ewe." From this he draws the conclusion, that their original colour was black; that art alone produced the white wool; and that if the best of the South Downs were left in a wild state, they would in a few years become black again.†

The South Downs are more hardy and active than the Leicesters, and therefore more desirable on moderately elevated grounds than any of the heavy species, which can neither travel far for their food, nor escape hastily into shelter on the sudden approach of storms.

To the exertions of Mr. Ellman, of Glynde, we are indebted for the great improvement in this breed, which previously was stunted and ill-shaped, though always remarkable for the good flavour of its flesh, and the fineness of its wool, in which, however, there is a small proportion of dark grey hairs, which render it unfit for some particular manufactures.

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* Library of Useful Knowledge.

† Ibidem.

Until the year 1800, these sheep were unknown in Ireland; they were then introduced by a very few spirited proprietors, (including the late Marquess of Sligo, and Mr. Wynne, of Hazlewood,) and for some time considered deficient in merit, as appears from the following statement of the then secretary of the Farming Society of Ireland:—

> "At the fourth exhibition of this stock for prizes at the October show of the Farming Society of Ireland, at Ballinasloe, in the year 1804, the judges could with difficulty prevail on themselves to allow them any merit, and the public inveighed against so fantastical a distribution of rewards. Indeed at that time, when wool was neither considered nor understood here by the growers, farther than as bringing promiscuously so much a stone in the bag, without any material difference of price; and when the English breeders (not so forward themselves as they are now) of course took care not to send their best animals away, the South Down exhibition, among stock farmers, unaccustomed to that sort of sheep, could not be expected to excite much admiration; but by judicious breeding, every succeeding year brought with it an increased improvement; when in the fourth year, a South Down hogget ewe, bred in Ireland, turned out against the field for the gold medal, and in a competition with several new Leicester sheep, was beaten only by a Dishley hogget of peculiar merit. This circumstance first pointed out the value of the South Down breed to many persons present, who from thence argued fairly, that if in that kind could be had, good shape, fine wool, and reasonable weight of well flavoured meat, the breed could not be a bad one. These qualities have become every day more and more conspicuous."*

Mr. H. Watson, of Keillor farm, in Scotland—a very extensive sheep-breeder—in a recent communication states, that after the experience of twenty-five years, in the management of South Down ewes, there can be no more profitable stock on pasture ranging from 500 to 1200 feet above the level of the sea, with a moderate portion of greensward appearing through whin (furze) and heather. His chief reasons for preferring this breed are—

> "That the South Down sheep, although naturally a spirited and active animal, are easily controlled and managed by a good shepherd; can go over more ground for their food than any other kind of sheep, without stopping their growth; and when tried by a severe storm in winter, will brave it better than even the black-faced highland; and although reduced very low in spring, sooner pick up condition than the other short-wooled sheep. As a proof of the South Down's inclination

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* Radcliff's Report of the Agriculture and Live Stock of the County of Wicklow.

to fatten, when put to good keep, I may mention a fact, that while I have seldom been able to produce a fat Cheviot ewe the same season she has reared a lamb, I never fail to make good fat of the cast South Downs *off grass*. Their wool is so closely matted on their backs, and about the head and neck, as to be almost impervious to rain or snow; hence, so soon as the storm ceases, they appear dry and comfortable, their coat not the least disordered, and altogether free from that *droukit* (Anglice, drenched) appearance, which longer wooled sheep exhibit, even for days, after a winter storm."*

He adds that they are remarkably healthy, without a single case of rot, though within twenty years he had cleared off a lot of Cheviot and black-faced sheep in consequence of that disease; he lost fewer also, in consequence of lambing, or any constitutional diseases. In many instances one-third of the ewes produce twins, which, where increase of numbers is a principal object, is a matter greatly in favour of the South Downs, especially as the ewes at two years old are excellent nurses.

Where folding is necessary, Mr. Watson found that the South Downs were more easily trained to the confinement than his other sheep; and he is decidedly of opinion that they are the most advantageous on situations "too high to be occupied during the whole season by a flock of Leicesters, and under that level where the native black sheep can thrive." He is now making experiments in crossing between the black-faced and the South Downs, of which he will one day give the results to the public.

A cross between the South Down and Leicester breeds, has been encouraged by the Ayreshire Farming Society. The rams have been let in England at very high prices, rivalling the Leicesters in this particular; and two of Mr. Ellman's rams were sold (forty years ago, at the valuation of the late Duke of Bedford) to Alexander, the late Emperor of Russia, for 300 guineas, which price the duke himself paid for two other rams to the same gentleman, who, on retiring from agricultural pursuits at an advanced age, was honoured with a handsome piece of plate presented by nearly two hundred noblemen and gentlemen, and bearing an inscription, commemorative especially, of his great merit in improving the breed of South Down sheep.

Arthur Young, in one of his later tours, bore testimony to Mr. Ellman's merits as an improver. "Mr. Ellman's flock of sheep (said he) is unquestionably the first in the country, the wool the finest, and the carcase the best proportioned; both these valuable properties are united in the flock at Glynde. He has raised the merit of the breed by his unremitting attention, and it now stands unrivalled."

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* Quarterly Journal of Agriculture, No. 40.

THE CHEVIOT SHEEP.

The Cheviots—Without horns, and middle or short-wooled, are as large as the South Down, and larger than the *black-faced*, and range principally on the grassy Cheviot hills. They are deservedly in great repute. Much pains have been taken to improve the breed, though to the deterioration of the texture of the wool. For the combined qualities requisite in a mountain breed these are unrivalled. The description by the "Lammermuir farmer" is as follows:—

> "They are hornless; the face and legs generally white; the eye lively and prominent; the countenance open and pleasing; the ear large, and there is a long space from the ear to the eye; the body is long; they are full behind the shoulder, have a long, straight back; they are round in the rib, and well proportioned in their quarters; the legs are clean and small-boned; and the pelt is thin but thickly covered with fine, short wool. The wool extends over the whole body, and comes forward behind the ear, but leaves the face uncovered. The muscle and the wool fall well down towards the knee; and although on the thigh the wool is somewhat coarse, the farmer is compensated by the abundant growth of it on that part."

The Cheviots have been successfully crossed with Leicesters, and have been greatly improved in consequence, without losing the natural hardiness, so essential in their usual locations; but their cross with the South Downs is said to have failed, as the produce could not endure the rigours of mountain pasturage in winter.

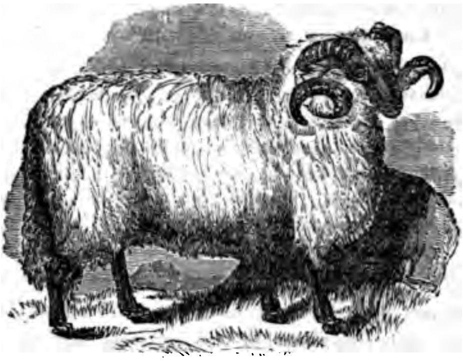
Sir John Sinclair considered the Cheviots, long before they were crossed with the Leicesters, (which injured the quality while it improved the carcase,) as remarkably suited to hard fare and severe weather, and excellent in flavour for the table.

> "Perhaps there is no part of the whole island where at first sight a fine-wooled breed of sheep is less to be expected than among the Cheviot hills. Many parts of the sheep-walks consist of nothing but peat bogs and deep morasses. During

winter, the hills are covered with snow for two, three, and sometimes four months, and they have an ample proportion of bad weather during the other seasons of the year, and yet a sheep is to be found that will thrive even in the wildest part of it. Their shape is excellent, and their fore-quarter, in particular, is distinguished by such justness of proportion as to be equal in weight to the hind one. Their limbs are of a length to fit them for travelling, and enable them to pass over bogs and snows, through which a shorter-legged animal could not penetrate. They have a closer fleece than the Tweeddale and Leicester breeds, which keeps them warmer in cold weather, and prevents either rain or snow from incommoding them. Their fleece is shorter, and consequently more portable over mountainous pastures. They are excellent snow-travellers, and are accustomed to procure their food by scraping the snow off the ground with their feet, even when the top is hardened by frost. They have never any other food, except when it is proposed to fatten them, than the grass and natural hay produced on their own hills. Their weight when fat, is from 17lbs. to 20lbs. per quarter; and, when fed on heath and kept to a proper age, their meat is fully equal in flavour to any that the highlands can produce."

What an admirable description is this! and how desirable that this breed should supplant the native mountain sheep of Ireland; yet there is another Scotch breed which contests the palm with these—

THE BLACK-FACED SHEEP.



THE BLACK-FACED.—These have (the females sometimes excepted) spiral horns, and black legs and faces, with wool on the forehead and lower jaw; they are bred principally in Lanarkshire, but are to be seen on all the Scotch mountains, and in elevated parts of the northern counties of England. Their wool is, according to Lord Napier's testimony before the House of Lords,

"Only half the value of the Cheviots. The latter also come to maturity twelve months sooner, and fatten much quicker. The grand point contested by the numerous advocates of the black-faced is, their extreme hardiness in the severity of

the climate of Scotland in the alpine districts. There probably may be localities in which, on account of climate or of food, or possibly the want of food, even these may fail, when the native sheep of the mountains may maintain their ground."*

These would probably make a good cross with the long-legged Irish mountain sheep. A cross between the black-faced and Leicester was exhibited at the Ayreshire Agricultural Association meeting at Cumnock, in June, 1838, which was considered very fine, and obtained a prize.

The Cheviot sheep-farmers prefer for those situations where the Cheviot sheep would not settle or *heff*, (as it is locally termed,) a cross between the Cheviot ram and the black-faced ewe; by continuing to give the Cheviot tup at every successive crossing, a breed of nearly pure Cheviot quality is obtained in the course of twenty years.

By this mode the Cheviots are introduced where the black-faced had been located. None but persons familiarized with the habits of these mountain species can understand the difficulty of getting fresh flocks of them to settle in any particular district.

We are assured by a gentleman long engaged in very extensive sheep-breeding on the Cheviot hills, that about fifteen years ago some sheep which had been driven from Caithnesshire to the western part of Rosshire—a distance of 100 miles—returned of themselves, and must have crossed a narrow *kyle* (or pill) on their journey. A ewe that had been three times sent from Roxburghshire to Yorkshire—distance 130 miles—returned twice, not over familiar mountains and in a direct line, but through a cultivated country, and by roads. This, however, is an old story, but believed to be perfectly true.

On account of the severity of the winter and spring climate in the northern parts of Scotland, the breeding of even hardy mountain sheep is principally confined to the southern parts of that kingdom, and the rearing of wethers, for which a more scanty subsistence is sufficient, to the northern parts.

The wool of this breed is inferior to that of the Cheviots, in quality, but greater in quantity. The lambs of the black-faced are more hardy, which is a counterbalance of some important weight. These sheep are ill suited to turnip diet.

Within the last twenty years, the mountaineers of Scotland have found the advantage of making circular stone enclosures, which they term *stells*, for their sheep, and cheap bridges over the mountain streams, by which countless numbers of sheep have been saved.

The wonder is, that any mountain pasture, where sheep are left to shift for themselves in severe weather, should have ever been without some artificial shelter against wind, and storm, and snow. Humanity and self-interest would, it might be supposed, have suggested this, even in the most barbarous times, and yet, even at this day, there is a woful want of these stells, or some similar protection, in the pastoral highlands of Scotland. The stells, according to the Hon. Captain Napier's details, in his Treatise on Practical Store-farming, should be substantially built of stone, of the diameter of 30 feet; they will hold each 75 sheep, and on an average cost only 39s.

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* Library of Useful Knowledge.

> "At the commencement of the fall," he remarks, "the sheep accustomed to the stells would naturally draw forward and reach them with little exertion, and there they would remain in safety, satisfied with the hay with which the stell is stored. When the sleet and snow drive fiercely down the glens, they seek for shelter in the stells; but the blast gone by, they return to their labour among the snow; and so much do they prefer the half-green grass to the best hay that can be provided, that they persevere in working through the snow to get it, so long as they feel themselves proof against the cold, and it may be left to their own choice whether to work without, or to find their sustenance within, and they will be seen many times in the day passing and repassing, according to the change or the prevalence of the blast. Instinct will teach them when to fly for shelter, and when to return to the pasture; and, at the same time, the shepherd may be with them rejoicing in the consciousness of his own safety as well as theirs."

Where stones are on the spot, we imagine that the expense will be considerably less, as the workmanship may be rude as the materials. The number of the stells must, of course, depend on the size of the flocks. On account of the difficulty of taking hay to distant stells on very high land, the farmers find it more economical to feed the breeding stock once or twice a day with oats, in troughs. 1lb. of grain, on an average, is a sufficient feed for each animal.

The loss of unprotected sheep is sometimes prodigious in the highlands of Scotland. To those accustomed to the comparative mildness of winter on the mountains of Ireland—especially in her southern portion—the details of a storm in Scotland will appear romantic. The following description from Hogg's Shepherd's Calendar, is too striking to be uninteresting.

> "Of all the storms that ever Scotland witnessed, or I hope will again behold, there is none of them that can be compared to that of the night between the 24th and 25th of January, 1794. This storm fell with peculiar violence on that division of the south of Scotland that lies between Crawford-Muir and the Border. In these bounds seventeen shepherds perished, and upwards of thirty were carried home insensible, who afterwards recovered. The number of sheep that were lost outwent any possibility of calculation. One farmer alone lost seventy-two scores; and many others in the same quarter from thirty to forty scores each. Whole flocks were overwhelmed with the snow, and no one ever knew where they were till the snow dissolved, and they were all found dead. I myself witnessed one particular instance of this. There were twelve score of excellent ewes, all of one age, that were missing all the time the snow lay, which was only a week, and no traces

of them could be found. When the snow went away, they were discovered all lying dead, with their heads one way, as if a flock of sheep had dropped dead going from the washing. Many hundreds were driven into waters, bourns, and lakes, by the violence of the storm, where they were buried or frozen up, and these the floods carried away; so that they were never seen by the owners at all. The greater part of the rivers on which the storm was most deadly, run into the Solway Frith, on which there is a place called the Beds of Esk, where the tide throws out, and leaves whatever is carried into it by the rivers. When the flood, after the storm, subsided, there were found, in that place and the shores adjacent, 1840 sheep, 9 black cattle, 3 horses, 2 men, 1 woman, 45 dogs, and 180 hares, besides a number of meaner animals."

The same person—the celebrated Ettrick Shepherd—gives an account of the extraordinary difficulties which, on another occasion, he experienced with his fellow-servants, and master, in their efforts to extricate a lot of 800 ewes from an enclosed field within 300 yards of the farmer's house. Four hours were occupied, after one night's storm, in clearing a passage to the sheep, which lay ten feet deep in snow. These were saved; but, out of a lot of 340 other sheep, under Hogg's peculiar care, which lay beyond the enclosure on the heathy mountain, and were overwhelmed by snow (all of them for another night, and many for a much longer time) sixty were lost altogether, and the survivors owed their extrication from the danger of suffocation to the sagacity of a dog, which scraped over the snow where they individually lay scattered. *Thousands* of sheep, and several shepherds on that occasion perished in the snow. The maternal solicitude of the ewes for their lambs, is thus very feelingly expressed:

"Sometimes the storm overtakes the flock at a distance from any shelter, and they crowd together, or are driven together by the shepherd, in the vain hope of protecting and warming each other; but very shortly some of the lambs are overwhelmed, and the mothers, as if to augment the confusion, lose all maternal instinctive sense, and are no longer able to recognise their own offspring, but run about bleating in wild amazement, or stop to smell at the various spots under which lie the victims of the blast, or where the plaintive cry of the little struggler may perhaps still be heard. All this wild agitation of the mothers aggravates the evil to a dreadful degree, and a scene of confusion and misery ensues, which will scarcely ever be forgotten by him who has witnessed it. It is better for the mother and the lamb when she is separated a little from the flock; she will then lay herself quietly down, opposing herself to the blast, and while life remains to her she will continue to shelter her offspring with her own body."*

Excessive moisture, especially, must be injurious to sheep, else how does it happen that the average loss of *yearlings* on the west coast of Scotland is double that on the eastern side? The mortality on the *Atlantic* side may be estimated at 20 per cent.—that on the eastern, at 10 per cent.

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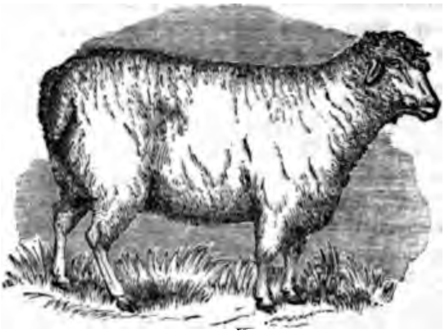
* Edinburgh Farmer's Magazine, 1824.

THE MERINO SHEEP.



THE MERINO is a fine-wooled sheep, first introduced from Spain into England by George III. This breed was also about the same time introduced into France, and the progeny increased considerably in size, weighing double the weight of the original stock, which is about 8lbs. per quarter.

Mr. Radcliff, in his Report of the Agriculture and Live Stock of the county of Wicklow, in 1812, remarks,

> "The groundwork, in point of shape, is much more promising in the Merinos than it was in the South Downs. Some of the most eminent breeders of Leicester sheep, when consulted upon this point, at the last October show, upon scrutinizing the lot of Merino ewes that gained the first prize, remarked, with some surprise, that though disguised by poverty and fatigue, their backs were level, their pelts fine, and their bone beautiful. They perceived also, that they were light in the offal, and not deficient as to a springing rib; and, with those qualities, they were of opinion that no argument could be offered against their capability of being brought in general to good form, nor did they see why, with those qualities, they should not also become fat sheep. Where a doubt exists as to the quality of the mutton, though the goodness of it is supported by very high authority in England, it is peculiarly satisfactory that in a little time this point will be here clearly determined; and though on this, as on every suggestion relative to the subject, the opinions of others should be received with the utmost deference, yet it cannot be considered a presumptuous expectation that Merino sheep, which possess the form and qualities above-mentioned, should not only fatten, but become mutton of excellent quality."

We have met one or two ameteurs in the mutton way, with peculiar tastes, in our judgment, who estimate this meat highly.

Two importations were made afterwards direct from Spain to Cork, and in consequence were bred in considerable numbers by Lord Lismore, and other Irish land proprietors; but they have rapidly fallen into disrepute from the great inferiority of the flesh, and the constitutional delicacy of the animal, which is not counterbalanced by the extraordinary value of the fleece, as wool can now be imported, for cloths of the finest texture, at a very moderate price.

In their native mountains, the Merino sheep are small. They are fine in the bone.

The Spanish shepherds give salt to their sheep in great abundance; which, while it keeps them in health, is a means of making them tractable in an uncommon degree, as they become excessively fond of it, and will follow the shepherd eagerly for it; and so anxious are they to get it, that the wildest among them will not refuse it from his hand. To see hundreds of these interesting creatures coming at their pastor's call, bleating, frolicking, and surrounding him on every side, is an interesting sight, and forcibly shows what gentle training may effect, even with the most timid animals.

Merino rams have been crossed on the highland, South Down, and other fine-wooled breeds. This has improved the fleece, but deteriorated the qualities of the breed in other respects.

"Flocks, however, of the pure Merinos have been preserved, and the progeny of these has remained superior to the new or cross-breeds. The naturalized Merinos retain their natural characters, though the wool becomes longer and heavier than in Spain, and the body more large. But the entire form of the Merino, as a feeding animal, is bad, being small, and the return in mutton therefore deficient both in quantity and kind. It is in vain that some breeders still contend for the superiority of the pure Merinos; the general judgment of farmers is against them, and with perfect reason. Could the breeders of this country look more to the fleece than the weight and value of the animal, as in Spain, and the parts of Germany where the Merinos have been naturalized, the culture of the breed might become profitable. But the breeder in England finds it his interest to direct attention mainly to the weight and value of the flesh; and while this is so, it will be more advantageous that this country import the wool of other countries, than that the feeders either adopt an inferior animal like the Merino, or sacrifice the more essential properties of the native sheep."*

We have from our Australian colonies admirable wool, and it is obviously our duty and policy to encourage the importation of it—the only species of agricultural produce which they can yet supply.

The very early yeaning of ewes of any breed, particularly in the colder parts of our islands, is not to be encouraged. As the ewe goes twenty weeks with young, it is easy to calculate the proper time for introducing the ram to her. Until the end of March or April (often at that season too) the weather is too severe for the tender lamb; besides, it should be considered that until April there is not a sufficient spring of grass for the ewes. With excellent enclosures and turnips, the yeaning may of course be earlier than under less favouring circumstances. Lambs are ruined by being weaned too early, which is generally the case when they are the offspring of the poor man's ewe. The temptation to take the milk for his children naturally enough induces him to do so at the expense of the poor lamb, who, so far from drinking "of his own cup," and lying "in his bosom," and being "unto him as a daughter," after it has been deprived of its natural sustenance, is turned out on a barren field with tight fetters, to bleat and mourn during the howlings of the wind and the pelting of the rain, and without any friendly guidance into shelter.

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* Professor Low.

It is usual to turn ewes into wheat in spring; but if the blade be too rank, this is an injudicious practice, unless care be taken not to let them feed too heartily on this soft food, which otherwise is apt to produce scouring; and as it is dangerous for them to be too fat at the time of bringing forth, luxuriant feeding ought to be avoided.

Sheep fed upon dry upland pasture are, beyond all question, the best for the table, though, for the farmer's profit, the luxuriant grass of the plains pushes them much more rapidly to their destination at the shambles. Feeding them for the market with turnips is also highly *profitable*, though the flesh is very inferior in flavour to that of sheep fed on the dry pasture just referred to. It is, however, often difficult to induce old sheep, especially of the mountain breeds, to eat them; they must be *starved* into a taste for turnips, though lambs will eat them readily enough.

There are different modes of feeding them on turnips.

The best practice is to draw a sufficient portion of turnips every day, and to lay them on a *fresh,* dry, and clean spot in a pasture field. The sheep will eat roots and tops, and they fertilize the spots where they feed.

The ordinary mode in England is to divide the turnip-field into patches by hurdles, and to confine the sheep on such a portion as they can consume in one day, and to advance gradually; but this practice, though far better than allowing an unrestricted range over the whole field, is in some degree wasteful, as the sheep only scoop out the inside of the turnip, and leave the remainder, and though the rejected parts may be pulled up and placed before the sheep again, they become so foul from the droppings of the animals as to be loathsome to them.

In purchasing sheep, it is judicious to select those that have been fed on soil inferior to that for which they are designed; and the best symptoms of a healthy condition, are redness of the gums, and of the skin at the brisket, whiteness and evenness of the teeth, firmness of the wool, sweetness of breath, and coolness of feet.

The principal diseases to which sheep are subject, must now be in some slight degree referred to.

The Rot.—This is a *disease of the liver*, arising, as is *almost* universally admitted, from pasturing on wet or ill-drained land—salt-water marshes excepted.

A few persons have maintained, and adduced some apparent facts to prove, that particular pastures, though *well-drained*, invariably engendered the rot in sheep fed upon them; and the possibility of this arising from the *quality* of the grasses, we are by no means prepared to deny, especially as we have seen inflammation of the liver, and death, in consequence, frequently attacking domestic rabbits fed upon *rank*, though not wet herbage—for it is well known that this disease affects rabbits precisely as it does the larger ruminants now under consideration; and in order to account for the influence of certain pastures in producing the rot, it is asserted by some theorists, that the eggs of animalcula scattered over certain fields are swallowed with the grass by the cattle, and conveyed into the stomach and intestines; that this animated pestilence, reaching the capillary vessels of the liver, find that organ a suitable residence, and then subsequently assume the organization and form of flukes in the liver, on which they feed until they thus destroy the suffering animal altogether. As it is ascertained that no ewe while giving milk is ever affected with this disease, the advocates of the fanciful theory just stated, in order to disentangle themselves from the dilemma in which they are naturally involved by the above fact, (for a ewe giving milk must swallow these eggs equally with her companions on the same pasture,) suppose that the eggs of the fluke-worm pass by the secretory milk-vessels into the milk, and thus flow off without reaching the liver. But this seems to be mere idle theorising. The fluke-worms are much more probably the effect than the cause of the rot, though they aggravate it. To the naked eye, viewed in the liver and the ducts connected with it, these flukes, as they are called, have the appearance of abscesses; they are, if observed with a microscope, perfectly organized animals, in shape like a sole; and, though some of them often appear in sheep not apparently unhealthy, they are indications that the disease has commenced, though we do not believe that they originate it. We are strengthened in this opinion by the following cases, which are strictly analogous. Worms often abound in the stomachs of human creatures and horses, and those infested by these predatory reptiles preying upon the substances which otherwise would be converted into the nourishment of the superior animal, pine away, sometimes even to death. Yet these worms are only among the effects of disease, and are generated in debilitated stomachs, which, when deprived by constitutional causes of their healthy tone, become predisposed to corrupting influences, and suitable receptacles for the worm.

Do mites *cause* the decomposition of cheese?—No; the tendency of the cheese to dissolution stimulates into life the living thing which previously had no existence, and gives to airy nothing "a local habitation and a name." In the same way, the fluke-worm is called into being, to feed upon the decaying liver, at the commencement of that state in which, by the order of Providence, it becomes critically suited to the support of the new-born parasite.

What then is the cause of the rot?—Continued moisture in the soil or the season. But

> "Then there is something more than moisture necessary for the production of the rot. The ground must be wet, and its surface exposed to the air; and then the plants previously weakened or destroyed by the moisture will be decomposed; and in that decomposition certain gases or miasmata will be developed that cannot be long breathed, or scarcely breathed at all by the sheep without producing the rot.
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> * * *
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> "Dr. Harrison confirms these facts. He refers to a farm in Lincolnshire which consists of high and low lands of loamy and tenacious nature. While a brook which runs through the farm remains unflowed, and the water continues upon the adjoining flat grounds, the sheep never suffer any inconvenience, though they are frequently obliged to wade for their provision; but as soon as the flood has subsided, they become tainted while the land retains its moisture, and the weather is hot and sultry. The butchers were well acquainted with this fact, and the importance of it; for when they purchased any fat sheep from him, they stipulated that they should be turned on Mr. Harrison's meadow before they were sent away, in order that they might be tainted with the rot, and thus improve more rapidly."*

Water-meadows in early *spring* will rarely occasion the rot, because then the vigour of the blade and the coolness of the air indispose the herbage to putrefaction, and the discharge of poisonous gases.

> "But in summer and autumn, when heat and moisture are combined, the case is different on *tenacious* soils, (for it is on these the danger lies,) especially if the land be overstocked, in which case the sheep are compelled to eat herbs, which otherwise instinct would teach them to avoid as tainted and unwholesome."*
>
> "It is a sound maxim in grazing, "*rather under-stock than over-stock land.*" There are many instances of farmers, who, having for a number of years kept a limited quantity of sheep on their lands, without rot in their flocks, have afterwards, on increasing their stock beyond a due proportion, sustained serious losses by that disease; and again, on reducing their flocks to their original standard, the rot has ceased."†

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* Library of Useful Knowledge.

† Quarterly Journal of Agriculture, No. 29.

It is sufficient for practical purposes to know, that a well-drained dry pasture is the best preservative against the disorder, and that, independently of the natural dryness of elevated lands, there is something in the quality of *heath* which is highly antiseptic, and conducive to the general health of sheep.

Salt marshes, however wet (as elsewhere stated) do not occasion the rot; the salt is evidently preventive of it.

Sheep in the incipient state of this disease do not lose their flesh, (the colour of which becomes pale,) but rather increase in fat. Experience will teach the grazier or the butcher the length of time to which the life of the diseased animal may be extended without loss; but the sooner he is disposed of in some way the better.

At the commencement of the disease, the symptoms are neither always apparent, nor at all defined. Dulness and want of appetite are the earliest indications of its existence. There is then a paleness, or rather yellowness, of the lips, the eyes, (the corner veins being swelled and filled with serous fluid,) and mouth, and of the skin at the brisket. But the description of the disease, as it advances, is best given in the words of the scientific treasury of information on which we draw so largely.

> "As the disease becomes confirmed, the yellow tinge begins to spread, the muzzle and tongue are stained, the animal is more dull and dispirited, his false condition rapidly disappears, the membrane of the nose becomes livid, the tongue gradually assumes the same character, the eyes are dull, and their vessels charged with a yellow-brown fluid. The breath now becomes fetid, the bowels variable, sometimes costive, and at other times loose, to a degree that defies the power of medicine. The skin often becomes spotted with yellow or black, the emaciation is more and more rapid, the general fever increases, the vessels of the eye are more distended and red, the caruncle is considerably enlarged, the skin becomes loose and flabby, and if it be pressed upon, a peculiar crackling sound is heard, the wool comes off when pulled by the slightest force, the appetite entirely fails, the belly begins to enlarge, on pressure, fluid is easily recognized within it, and hence one of its names, 'the hydropic,' or dropsical rot. The animal is weak in every limb, a violent purging is now very frequently present, the sheep wastes away to a mere skeleton, and at length dies."*

It has been already said that a dry upland pasture is the best preventive, and that salt is a preservative.

When the rot has decidedly appeared, the best mode of curing, the Irish way—all the sheep being in good condition—is to put the butcher's knife into the sheep's throat, and to bleed the animal to death.

The next best plan is, to bleed pretty freely, but not to destroy life, and to administer a dose of glauber or Epsom salts. If there be a salt marsh within reach, let the tainted sheep be immediately sent there; if not, common rock or other salt should be given in liberal quantities, and they should have a change of pasture, or, if the season be wet, kept on salted hay, and other food with the same condiment, in the farm-yard.

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* Library of Useful Knowledge.

Unless the disease has made much progress, the above simple remedies (especially the first) will be found efficacious. If the malady be of some standing, and violent, it must be treated as a severe complaint of the liver in the human subject; mercury must be given, either by friction on the region of the liver, or in daily doses of two or three grains (calomel) mixed with half the quantity of opium.

Happily, the rot is neither infectious nor hereditary, but occasioned by the causes already mentioned.

Foot-rot proceeds remotely from soft, moist pasturage; and directly from obstruction in the secretory outlet between the claws, which, if examined on the first indications of lameness, will be found hot and tender. *According to the writer of the* "Sheep," it exists to a greater or less extent in every situation that has a tendency to increase the growth of the hoofs without wearing them away. The soft pasturage on which the sheep is occasionally put, presents little, if any, of that rough friction to which the feet of the animal is naturally intended to be exposed. The crust, therefore, grows unrestrained, until it either laps over the sole, like the loose sole of an old shoe, and serves to retain and accumulate earth and filth, or is broken off in detached parts, in some cases exposing the quick, or opening new pores, into which particles of earth or sand force their way, until, reaching the quick, an inflammation is set up, which, in its progress, alters or destroys the whole foot.

Sheep that are brought from an upland range of pasturage to low, confined fields are more particularly subject to it. While they were obliged to ramble on account of the scantier production of the upland pasture, and also in consequence of the greater hardness of the ground, the hoof (according to the notion of our theorist) was worn down as fast as it grew; but on its new and moist habitation the hoof not only continued to grow, but the rapidity of that growth was much increased, while the salutary friction which kept the extension of the foot within bounds, was altogether removed. When the nails of the fingers or toes of the human being exceed their proper length, they give him so much uneasiness as to induce him to pare them, or, if he neglects this operation, they break. He can pare them after they have broken, and the inconvenience soon ceases, and the wound heals. When, however, the hoof of the sheep exceeds its natural length and thickness, that animal has no power to pare it down, it continues, therefore, to fester unless the cause of irritation is removed.

Notwithstanding the highly respectable source from which this information is derived—with the opinion of Professor Dick to corroborate the hypothesis—we venture to think that inflammation in the foot may originate solely in *moisture*, under certain combinations, without any material connexion with the overgrowth or distorted structure of the hoof.

There is much more curious matter in the same work on this subject.

If the disease progresses, ulceration (with maggots in the sores) takes place, and the poor animal, after moving about on its knees, as long as it can, dies from pain and starvation.

The writer above alluded to, is an enemy to all poultices, and prescribes the removal by a sharp-pointed and curved knife of *every* portion of horn that is *in the slightest degree separated from the parts beneath*—after this a perfect cleansing, and a washing "with a solution of chloride of lime, in the proportion of one pound of the powder to a gallon of water." The next application recommended is, "the muriate or butyr of antimony, applied to every denuded part," on a bit of tow tied to a pointed stick, severely or not, according to the healthy or diseased state of the surface. "There is no application comparable to this. It is effectual as a superficial caustic, and it so readily combines with the fluids belonging to the part to which it is applied, that it quickly becomes diluted, and comparatively powerless, and is incapable of producing any deep or corroding mischief." If much of the horn has been removed, the foot should be cased in tow, and the sheep should be put on a dry pasture, or into a straw-yard. The caustic application should be repeated daily if the hoof continues soft or spongy, but not otherwise. Some, instead of using caustic, have preferred a blister composed of 4oz.* flies, 2 quarts of fish oil, 2 quarts of tar oil, daily, until the unsound part has sloughed off, and then washed with an astringent lotion. In mild cases, Hogg's recipe may be effective—"let the sore foot be well washed with soap and urine, and then bathed with turpentine, and afterwards rubbed all over with tar, and bound up with flannel." We prefer the caustic application. Prudence suggests the separation of sheep affected with the foot-rot from the sound part of the flock, while any discharge takes place from the sores; although many persons, Professor Dick included, maintain that the foot-rot is not infectious; ascribing it, as he does *entirely*, to a distorted form of hoof from the want of paring it down, either by natural friction on the pasturage, or artificial trimming by the shepherd.

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* Sufficient for a numerous flock.—*See Radcliff's Report of the County of Kerry.*

A host of names, however, appears on the side of the contagionists, with James Hogg among them, who says, "it is highly infectious; for it has often been known that the driving of an infected flock over part of another farm, has brought it upon the flock of that farm with the utmost virulence."

Mountain sheep are never, while on their dry lands, and in full exercise, affected with the true foot-rot; they may have galled feet from over-travelling, but not the disease we have been treating of. This "was not known until the modern system of improvement commenced —until the carcase was heavier, and its support lessened in bulk— until the flesh and the fat were increased, and the bone and the horn diminished. Allied to this is another fact, that ewes in lamb are peculiarly subject to foot-rot, on account, probably, of the additional weight which the feet have to support."*

Scab—A cutaneous affection, originating in impurity of blood, and prevailing in the early summer months, either after bad winter keeping, or during excessive dampness of soil or atmosphere, or indeed in any of those causes which tend to suppress the natural perspiration. It is propagated, like the itch in the human skin, by little insects which infect the pustules. When these are destroyed by any application, there is no danger of infection from one sheep to another. The scab (of which veterinarians enumerate varieties) is indicated by the extreme uneasiness of the patient, and by *scratching* (which, in man or beast, is an infallible test of *itching*, the full luxury of which can only be fully estimated by those who have had the itch in genuine perfection) against hedges and walls, often so forcibly, or continuously, as to rub off the wool in flakes.

Many remedies have been prescribed; any composition which kills the *Acarus Scabiei*† (the species of insect generated in the sores) will produce the effect.

The following recipe, communicated by the late Sir Joseph Banks, has been found remarkaby efficacious:—

"Take one pound of quicksilver, half a pound of Venice turpentine, half a pint of oil of turpentine, and four pounds of hog's-lard. Let them be rubbed in a mortar till the quicksilver is thoroughly incorporated with the other ingredients;

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* "The Sheep."

† "M. Renucci, a student of the Hotel Dieu, has been the first to put beyond a doubt the existence of the genuine Acarus Scabiei. It has its fore-legs strongly developed, while its hind-quarters are comparatively feeble; it is thus enabled to burrow under the cuticle, and to make a road for itself as it proceeds."—*Medical Gazette.*

for the proper mode of doing which, it may be proper to take the advice, or even the assistance, of some apothecary or other person used to make such mixtures.

"The method of using the ointment is this:—Beginning at the head of the sheep, and proceeding from between the ears along the back to the end of the tail, the wool is to be divided in a furrow till the skin can be touched; and, as the furrow is made, the finger, slightly dipped in the ointment, is to be drawn along the bottom of it, where it will leave a blue stain on the skin and adjoining wool; from this furrow similar ones must be drawn down the shoulders and thighs to the legs, as far as they are woolly; and if the animal is much infected, two more should be drawn along each side parallel to that on the back, and one down each side between the fore and hind legs.

"Immediately after being dressed, it is usual to turn the sheep among other stock, without any fear of the infection being communicated; and there is scarcely an instance of a sheep suffering any injury from the application. In a few days the blotches dry up, the itching ceases, and the animal is completely cured; it is generally, however, thought proper not to delay the operation beyond Michaelmas."

If a cure is not effected by one application, another must be given after two or three days, or a rubbing of common mercurial ointment and hog's-lard.

The above, or any mercurial ointment, is said to be beneficial to the roots of the wool, which is injured, at least not improved, by decoctions of tobacco, or a lotion of arsenic and water, (in the proportion of a quarter of a pound of arsenic to six quarts of water,) though these applications cautiously used will also cure the disease with certainty. The same may be asserted of a lotion of alum, brimstone, and tobacco-water, boiled together, and rubbed round the blotches after the wool has been drawn aside; or of another wash, composed of lime-water or brine, and a decoction of tobacco, in the proportion of one pound to two gallons of the liquid.

Lice and *Ticks.*—These are very tormenting, but not formidable antagonists. They generally attack lambs and yearlings, in preference to older sheep. Ticks are principally found about the shoulders where the wool is finest, and are destroyed by the same treatment as has been recommended for the cure of the kindred scab. It is necessary to take the precaution of using the above remedies only in dry and very mild weather. Mr. Thomas Harkness, of Garrachoran, gives a caution against extravagance in smearing. He says—"People suppose that by laying on a great quantity, they are sure of killing the vermin; not keeping in view that, unless it meets with such a degree of heat as to dissolve it, it will remain where it has been laid. When a sheep is properly smeared, no tar appears on the wool, excepting at its roots, the other parts being quite loose and clean."* This practical person thinks that tobacco-juice, solutions of arsenic, &c. without tar, wash off too quickly. He uses the following mixture, which will smear 72 sheep, at 1½d. each:—12 pints of tar, 2 gallons of seal oil, 2 pounds of soda, 3 stone of potatoes* (mashed and well-boiled.) The oil and the soda are to be poured on the potatoes, and the mass to be blended together, and then added to a gallon of urine, and poured when milk-warm on the tar.

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* Quarterly Journal of Agriculture, No. 22.

The great sheep farmers smear *all* their sheep, in the way of *prevention* as well as of cure. Where it has been abandoned as a preventive, lice, &c. have affected the flock in consequence.

The Fly.—The insects from which this disease has its designation live in the wool, and so torture the animal by biting, as to prevent it from thriving. Sulphur, mixed with butter or fish oil, which the fly dislikes particularly, rubbed in with the hand, have been found remedial without injuring the wool.

Flies are very apt to torment sheep about the head, on those parts free from wool, and on the buttocks, or wherever the skin has been abraded. Hogg asserts in his Shepherd's Guide that *fish* oil—the more rancid and coarser the better—if rubbed on the skin will keep them off more effectually than tar or any other substance. Oil of Naptha from the gas-house is the remedy.

If maggots are generated, they must be scraped off, and a mixture of turpentine and spirits rubbed on the affected part.

Apoplexy.—The fatter the condition of the sheep, the greater the danger of apoplexy, particularly in hot weather, if the sheep be loaded with wool, so that perspiration cannot freely take place. In this disorder, the animal lies down, and wallows, and dies instantly, from the impulse of blood to the brain, unless bled in the jugular vein. This can be done by any handy person with a sharp-pointed pen-knife. "Four ounces of Epsom salts should be administered as soon as possible after the bleeding, and an additional ounce every six hours until the bowels are opened."† Abstemious diet should succeed for some days afterwards.

Sheep sometimes suffer severely from *heat* when overloaded with wool; a good wetting with fresh water, and *shade*, will relieve them until they can be shorn.

Paralysis affects the mountain sheep in the spring season, when they are in *poor* condition; they become lame, swell in the joints, and get a twist in the neck; they jump up suddenly and fall down dead at once, or linger a little.

They should be bled and physicked with salt as for apoplexy, or the

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* To enable the operator to clean his hands from the tar.

† "The Sheep." The farmer is recommended to take half a pound of blood from all his other sheep in good condition, and to give them the same dose of salts, as preventives.

Garget.—This is inflammation of the udder, occasioned by various causes. Aperient medicine should be given, and the inflamed parts fomented with warm water, in the first instance; bleeding will be necessary in violent cases, and if the ailment does not subside from the simple fomentation, and prevents the lamb from sucking, elder ointment and similar emollients should be rubbed on the tender part.

If matter be generated it must be let out by the lancet in the usual way, after which fomentations will be necessary.

The inflammation is sometimes so great, that, if not stopped in the course of twenty-four hours, mortification rapidly spreads, and the sheep dies.*

Costiveness. This attacks sucking lambs sometimes, and arises from the coagulation of milk in their stomachs. Half an ounce of Epsom salts, (repeated every six hours until the bowels are relaxed,) is prescribed.

Loupinelle, is either identical with apoplexy, or a modification of it. The joints swell in this disease. It is said not to appear where the *tick* is absent.

Red-water.—This is another name for acute dropsy, and is either so termed from the red colour of the urine, or of the water contained in the belly.

If this be incipient, the sheep will give some intimation of ailment by lameness, a slight swelling of the joints, difficulty of breathing, and inability to keep up with the flock;—lay the patient on its back and feel the belly; if there be water there, it will be perceived to float, and make a gurgling noise. This disease, which often attacks lambs on chilling pasturage when first yeaned and deprived of the warmth of the mother, runs its course very rapidly, and is so generally fatal, (the bloody serum bursting from the nose and mouth in large quantities,) as to render it prudent to kill the sufferer at once. If not, it should be bled profusely, and have a dose of Epsom salts, or two oz. of castor oil, repeated for four or five succeeding days, if necessary.

There is a kindred disease, called *la clavellee*, very fatal in France and other parts of the continent, where the sheep are often half starved; it appears in a pustular form. The virus, called le claveau, a sheep pox, has been used for inoculation, and found a preventive against the disease in a malignant form.

The *Braxy.*—This is a Scotch term applied to inflammation of the bowels of a very acute kind, arising from succulent food.

Mr. James Carmichael, of Raploch Farm, in Stirlingshire,† attributes this entirely to the sheep feeding on rank grass, loaded with *hoar-frost.* It is stated by this gentleman,

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* Hogg's Shepherd's Guide.

† Quarterly Journal, No. 49.

"That a night of hoar-frost is invariably followed on the second or third day by a number of deaths, or cases of braxy, especially where the pastures have a *steep, northern exposure, or are shaded by brushwood, copse, or ferns,* all of which are very unfit as walks for hoggs, or young sheep, though much sought after, because the hoar-frost is deposited soonest and remains longest amidst these shaded situations."

There is a disease, called the *Braxheugh* by the Cheviot graziers, which occasions *dysentery;* it is like cholera, and very infectious. Sheep affected with it drink water.

Acute dysentery is also occasioned by rank and moist food. For this ailment physic and bleeding (the latter, however, only when fever is present) are indispensable. Castor oil—from one to one and a half ounces—is an excellent medicine, or about the same quantity of Epsom salts, with forty or fifty drops of laudanum to allay the pain; even though much looseness should prevail, two doses of physic should be fearlessly given to allay the feverish irritation, and to remove the foul matter which collects in the larger intestines. Mashes and gruel, and food that is not of a relaxing quality, should at the same time be afforded. If the first doses do not effect the object, Mr. William Dick recommends "half a drachm more of laudanum, with two drachms of chalk, administered in a little milk or starch, or oatmeal gruel, till an effect is produced, with fomentations of hot water applied (in case of pain) to the belly."*

After the physic has sufficiently discharged its part, the astringent called "sheep's cordial" should be given, or any strong tonic mixtures, consisting of such astringents as ginger, gentian, and powdered ipecacuanha, opium, boiled starch, &c.

Diarrhœa, or the *common scour*, differs from dysentery in affecting the numerous membranes of the smaller intestines, whereas dysentery is an inflammation of the larger intestines. Diarrhœa degenerates into dysentery only when neglected.

Lambs when first weaned are liable to it, and full-grown sheep also, on rank or very soft and succulent food.

It is not considered advisable to stop a moderate looseness too suddenly, as such effort of nature, if not excessive, is often healthful. If dry food does not produce the desired effect, clysters of warm milk and water may be tried; and if these fail, the same treatment as for dysentery becomes necessary.

Sheep unfortunately will rarely eat dry hay after feeding on the spring grasses, so that it is difficult to give them astringent diet in sufficient quantities. Both diarrhœa and acute dysentery abate if physic be given in the early stage, and the proper change of food afforded.

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* Quarterly Journal of Agriculture.

Sheep are often wounded by dogs and various accidents. For trifling injuries of the flesh, warm oil or fresh butter is a good remedy. Bruises, in which there is a collection of stagnant blood, will be relieved by rubbing the affected parts with the oil, &c., which will promote the circulation of the blood. In case of corrupted matter, the sores should be opened and dressed with soap, fresh butter, and whiskey or other spirits, boiled together. Sometimes a swelling or wen appears under the throat, which, if allowed to extend, would suffocate the victim; shear the wool around, and rub the swelling regularly, until it abates, with the following ointment:—1qr. lb. hog's lard, 2 oz. common soap, 1 glass spirits.

There are various other ailments for which the reader may best consult "The Sheep," or the Shepherd's Manual. We shall, however, notice, in conclusion, from their very extraordinary nature, two other diseases:—

"Sheep are infested with worms in their nose called *œstrus ovis*, and produced from the egg of a large two-winged fly. The frontal sinuses above the nose in sheep and other animals are the places where these worms live and attain their full growth. These sinuses are always full of a soft, white matter, which furnishes these worms with a proper nourishment, and are sufficiently large for their habitation; and when they have here acquired their destined growth, in which they are fit to undergo their changes for the fly-state, they leave their old habitation, and, falling to the earth, bury themselves there; and when these are hatched into flies, the female, when she has been impregnated by the male, knows that the nose of a sheep or other animal is the only place for her to deposit her eggs, in order to their coming to maturity. Mr. Vallisnieri, to whom the world owes so many discoveries in the insect class, is the first who has given any true account of the origin of these worms. But though their true history had been till that time unknown, the creatures themselves were very early discovered, and many ages since were esteemed great medicines in epilepsies.

"The fly produced from this worm has, all the time of its life, a very lazy disposition, and does not like to make any use either of its legs or wings. Its head and corselet together are about as long as its body, which is composed of five rings, streaked on the back; a pale yellow and brown are there disposed in irregular spots; the belly is of the same colours, but they are there more regularly disposed, for the brown here makes three lines, one in the middle, and one on each side; and all the intermediate spaces are yellow. The wings are nearly of the same length with the body, and are a little inclined in their position, so as to lie upon the body; they do not, however, cover it; but a naked space is left between them. The ailerons, or petty wings which are found under each of the wings, are of a whitish colour, and perfectly cover the balancers, so that they are not to be seen without lifting up these.

"The fly will live two months after it is first produced, but will take no nourishment of any kind; and possibly it may be of the same nature with the butterflies, which never take any food during the whole time of their living in that state."—*Reaumur*, *Hist. Inst. vol. iv. p.* 552, &c.

"The shepherds on the continent trepan openings into the cavities of the nose (the frontal and maxillary sinuses) and affect their removal; but our shepherds have not succeeded in the operation."*

Fortunately our shepherds have not often occasion to lament their want of skill in this particular, as this disease of frontal worms is, we believe, extremely rare, if not altogether unknown to us.

The *staggers*, *worm*, or *water* in the *head*.—This disease (still more extraordinary than the last) goes by these and other names, and is caused by a little worm which finds its way to the brain. The affected sheep appears foolish and bewildered. The effectual remedy is to trepan the scull. Hogg used to put a stocking wire up the nostril, by which the bladder (or *hydatid*) in which the insect was imbedded, was ruptured. Some French practitioners have had the ingenuity to pass a sharp-pointed red-hot wire through the skull to the surface of the brain.

However, it would seem necessary to ascertain the locality of the hydatid before any such attempt to eradicate its inhabitant could be made, and even then it would surely be a very nice operation, indeed, to burn the skull without injuring the brain.

If any of our readers contemplate emigration to our Australian settlements, the subjoined extract from the Appendix to the 1st Vol. of Captain Sturt's work† on New South Wales will afford them satisfactory information:—

SHEEP—FARMING RETURNS, SHEWING THE INCREASE IN FOUR YEARS, FROM TWO BREEDING FLOCKS, CONSISTING OF SIX HUNDRED AND SEVENTY EWES IN LAMB.

(A.)—1st. JUNE, 1828.

Flocks.	Breeding Ewes.		Lambs.		Total.	Remarks.	
	2 years old.	3 years old.	Male.	Female.			
No. 1.	330		148	149	627	Deaths 6	Lambs Increase 297
— 2.		330	154	154	638	4	Do. 308
				‡	1265	10	605

ABSTRACT.

Purchased two Flocks of Ewes, at 84s. - - -		670 Ewes.
Increase of Lambs - - - -	605	
Casual Deaths - - - -	10	595
Total as per Return - - -		1265

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* Loudon's Encyclopædia of Agriculture.

† Published by Smith, Elder, and Co. London.

‡ The increase throughout these returns is calculated at from 270 to 290 Lambs, to 300 Ewes, which is the usual average in N. S. W.

(B.)—1st. JUNE, 1829.

Flocks.	Breeding Ewes.	Maiden Ewes.	Wethers.	Rams.	Lambs.		Total.	Remarks.	
					Male.	Female.			
No.									Lambs.
1. 3-yr.	327				154	154	635	Deaths 3	Increase 308
2. 4-yr.	326				155	155	636	Do. 4	„ 310
3. 1-yr.		302					302	Do. 1	„ 618
4. 1-yr.			302	18			320	„ 8	
							1893		

ABSTRACT.

Return (A) Total			1265
Increase by Lambing	618		
Ditto Rams purchased	18		
		636	
Casual Deaths		8	628
Total as per return			1893

(C.)—1st. JUNE, 1830.

Flocks.	Breeding Ewes.	Maiden Ewes.	Wethers.	Rams.	Lambs.		Total.	Remarks.	
					Male.	Female.			
No.									Lambs.
1. 2-yr.	296				133	133	562	Deaths 6	Increase 266
2. 4-yr.	325				150	150	625	„ 2	„ 300
3. 5-yr.	326				160	160	646		„ 320
4. 2-yr.			302	27			329		
5. 1-yr.			309				309		886
6. 1-yr.		309					309		
								3 Rams died.	
							2780	12 „ purchased.	

ABSTRACT.

Return (B) Total			1893
Increase by Lambing	886		
Ditto Rams purchased	12		
		898	
Deaths		11	887
Total as per Return			2780

(D.)—1st. JUNE, 1831.

Flocks.	Breeding Ewes.	Maiden Ewes.	Wethers.	Rams.	Lambs.		Total.	Remarks.	
No.					Male.	Female			Lambs.
1. 2-yr.	304				136	136	576	Deaths 5	Increase 272
2. 3-yr.	293				135	136	564	„ 3	„ 271
3. 5-yr.	324				156	156	636	„ 1	„ 312
4. 6-yr.	320				156	156	632	„ 2 Killed 4	„ 312
5. 3-yr.			300				300	Deaths 2	——
6. 2-yr.			308				308	„ 1	1167
7. 1-yr.			443				443	„ 1	
8. 1-yr.		442					442	„ 5	
9.				40			40	—	
								20	Purchased 12

ABSTRACT.

Return (C) Total - - - - - -		2780
Increased by Lambing - - - -	1167	
Ditto Rams purchased - - - -	18	
	——1185	
Casual deaths 20.—Killed for use -	24	1161
Total as per Return - -		3941

(E.)—1st. JUNE, 1832.

Flocks.	Breeding Ewes.	Maiden Ewes.	Wethers.	Rams.	Lambs.		Total.	Remarks.		
No.					Male.	Female.				Lambs.
1. 2-yr.	344				154	154	652	Deaths 6	Increase	308
2. 3-yr.	344				162	161	667	„ 4	„	323
4. 3-yr.	342				164	165	671	„ 3	„	329
5. 6-yr.	320				155	155	630	„ 2	Killed 2	310
6. 7-yr.	300				145	145	590	„ 2	„ 18	290
7. 4-yr.			300				300			1560
8. 3-yr.			302				302	„ 2		
9. 1-yr.			440				440	„ 1	„ 2	
10. 1-yr.			583				583		22	
11. 1-yr.		584					584			
12.				45			45	„ 5	Purchased	10
								25	Casual deaths	
	1650	584	1625	45	780	780	5464			

ABSTRACT.

Return (D) Total - - - - -			3941	
Increase by Lambing - - -	1560			
Do. by purchase of Rams - -	10			
		1570		
Decrease by casual death -	25			
Do. by slaughter for use -	22		1523	
		47		
Grand Total - - -			5464	as above.

Memorandum.—The deaths have been calculated at the lowest rate under the best management. It may be safer to assume a rate of four or five per cent. per annum.

Account of Expenditure and Income upon Sheep Stock in Australia, appended to Returns A. B. C. D. & E.

1st YEAR, (RETURN A.) JUNE, 1829.

INCOME.			
By 1265 fleeces, average weight 2¼lbs. 2846lbs. wool at 1s. 6d. per lb. - - -		£213 9 0	
EXPENDITURE.			
To 2 Shepherds at £30	60 0 0		
To 1 Watchman 20	20 0 0		PROFIT.
To Hurdles, &c	10 0 0		
		90 0 0	
			£123 9 0

2nd YEAR, (B.) JUNE, 1830.

INCOME.			
By 1893 fleeces, at 2¼lbs. 4259lbs. wool at 1s. 6d. - - - -		£319 8 6	
EXPENDITURE.			
To 2 Shepherds at £30	£60 0 0		
To 2 Ditto 20	40 0 0		
To 1 Watchman	20 0 0		
To Hurdles, &c.	5 0 0		
	£125 0 0		
To 18 Rams at £10*	180 0 0		
		£305 0 0	
			14 8 6

3rd YEAR, (C.) JUNE, 1831.

INCOME.			
By 2780 fleeces, at 2¼lbs. 6255lbs. wool at 1s. 6d. - - - -		£469 2 6	
EXPENDITURE.			
To 2 Shepherds at £30	£60 0 0		
To 1 Ditto 25	25 0 0		
To 3 Ditto 20	60 0 0		
To 2 Watchmen 20	40 0 0		
To Hurdles, &c.	10 0 0		
	195 0 0		
To 12 Rams at £10	120 0 0		
		£315 0 0	
			154 2 6
		Carried forward	£292 0 0

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* The price of Rams will probably fall to £5.

			PROFIT.
Brought forward			£292 0 0

4th YEAR, (D.) JUNE, 1832.

INCOME.			
By 3941 fleeces, at 2¼lbs. 8867lbs. wool at 1s. 6d. - - - - -		£665 0 0	
EXPENDITURE.			
To 2 Shepherds at £30	£60 0 0		
To 2 Ditto 25	50 0 0		
To 4 Ditto 20	80 0 0		
To 3 Watchmen, &c, (1 to take take charge of Rams)	60 0 0		
To Hurdles, &c.	10 0 0		
	260 0 0		
To 18 Rams at £10	180 0 0		
		£440 0 0	
			225 0 0

5th YEAR, (E.) JUNE, 1833.*

INCOME.			
By 5464 fleeces at 2¼lbs. 12,294lbs. wool at 1s. 6d. - - - - -		£922 0 0	
EXPENDITURE.			
To 2 Shepherds at £30	£ 60 0 0		
To 3 Ditto 25	75 0 0		
To 5 Ditto 20	100 0 0		
To 3 Watchmen 20	60 0 0		
To Hurdles, &c.	20 0 0		
	315 0 0		
To 10 Rams at £10	100 0 0		
		£415 0 0	
			507 0 0
Nett Profit by sales of Wool in five years			£1024 0 0

£1024 divided by 5, gives £204 8s. 0d. for annual interest, on the original capital of £2814, (about 7¼ per cent. per annum,) in addition to the accumulation of capital itself, shewn by the valuation of stock.

VALUATION OF SHEEP, JUNE, 1832.—(RETURN E.)

1614 Ewes from 1 to 4 years old	£3 each - - -	£4842 0 0
620 Do. 4 to 7 years old	2 „ - - -	1240 0 0
780 Female Lambs	2 „ - - -	1560 0 0
2405 Wethers and Male Lambs	15s. - - -	1803 0 0
45 Rams (original cost, 450*l.*)	- - -	400 0 0
		£9845 0 0

Note.—About £500 would be added to the income on the fifth year, by the sale of wethers of 3 and 4 years old.

The cost of rams ought, strictly speaking, to be added to capital, and not deducted from income; but these returns were made out in their present form at the request of a gentleman proceeding to the Colony with a limited capital, and who wished to know how much he might safely invest in sheep.

* These accounts are a year in advance of the Sheep returns, in order to bring them to the time at which the wool would be sold.

SMUT. See *Blight.*

SOILING.—This term is applied to the system of feeding cattle with green herbage. The advantage of soiling with *clover*—which for certainty and abundance and adaptation to almost every soil, surpasses all other grasses—cannot be too strongly or too frequently urged. There is no method of management so profitable, when a sufficient supply of straw or other litter can be afforded. It is plain that the same extent of land will produce a much greater proportion of food, when cut green for soil, than when depastured or made into hay; for in the latter case, a great waste of the juices takes place by evaporation; and in the other, the blades are prematurely nipped.

Sheds may be raised for the small farmer with little or no expense. He can easily shelter his cows by driving stakes into the ground, and winding the boughs of trees through them, the roof being formed of heath or straw, or any similar material. One man can supply twenty head of cattle in the day; and an ass will be able to draw sufficient quantities, morning and evening, unless the stock be very considerable. When the quantity of clover brought from the field happens to be too great for immediate use, that part which is to be kept for the ensuing day should be spread thinly and under cover, to prevent its fermentation, and the effects of sun and wind.

To the pasture farmer, the number of cattle and of *pigs* that may be abundantly fed by soiling on a luxuriant acre of clover or lucerne, appears fabulous. We shall however hazard a request, if any mere grazier should honour this book with his attention, that he will make the experiment, at least as regards milch cows, and he will assuredly find reason to admit the advantage of the system in summer, by which his stock may be so incalculably increased. But a great source of profit, under the soiling system, arises from cutting and bringing to stables and cattle-sheds, the otherwise waste grass of headlands, ditches, orchards, and converting it into manure. How much food of *this* kind is allowed to run to waste and to *seed*, by almost every farmer, instead of being applied to a beneficial purpose! See *Manures.*

SOOT. See *Manures.*

SPADE HUSBANDRY.—The substitution of the spade for the plough in field husbandry, as the most remunerating source of employment for our redundant agricultural labourers, has many powerful and practical advocates.

The arguments in favour of the spade in preference to the plough are to this effect:

1. The land is worked to a much greater depth by the spade, more

effectually loosened and pulverized, and consequently rendered productive in a much higher degree, both as regards the crop for which the labour is first applied, and that which succeeds.*

2. Where manure is used, the spade covers it more effectually and divides it more evenly.

3. Where land abounds with *couch*, it can be better eradicated by spade culture; and all annual and biennial weeds, being completely turned over and buried, are destroyed, a fresh surface being at the same time exposed.

4. That the increased expense of manual labour will be amply repaid.

Mr. Archibald Scott, of Southfield, near Haddington, in East Lothian—who obtained a prize of £100, which the Rev. C. Gardiner, a clergyman of the church of England, had proposed for the best plan of giving employment to the poor of England—makes some very judicious remarks, and states in his details some striking facts bearing on the point in question. It would be injustice to Mr. Scott to abridge any of the following matter:—

"It is impossible, for me at least, to offer any improvement on the present Scotch poor laws, and as I presume you are thoroughly acquainted with their workings, I shall forbear any further remark than simply to state that only the aged, the sick, and the infirm derive any benefit from them; and that the able-bodied labourer, though he may find it impossible to obtain work, has no claim to parochial relief. This, I think, is just as it should be, and is in reality a great blessing to the Scotch peasantry; they are, in consequence, trained up with notions of independence, as they are aware that they have themselves, and themselves alone, to look to for support, and the knowledge of this makes them prudent, industrious, and economical.

"Notwithstanding all this, I am quite aware that there are many cases of great hardship and great individual distress, at particular seasons of the year, from want of employment; but this, I am afraid, cannot be satisfactorily remedied by any system of poor laws or legislative enactments; it is the landed proprietors and their tenantry who alone can do it, yet it becomes an object of paramount importance to the landed interest of the kingdom.

"I am quite convinced there is but one way of employing the surplus population of England and Ireland, and that is by a judicious introduction of spade husbandry; and I am also convinced that a system of management can be pointed out whereby every labourer of Great Britain might be employed with profit to his employer and advantage to the country.

"I should think it will hardly be denied by any one at all versant in agricultural operations, that work done by the spade is superior to work done by the plough, and that the only drawback is the great additional expense. Now, if I can show that, at a particular period of the rotation, spade husbandry is not only superior, but less expensive, I shall have got over this difficulty.

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* Mr. Falla, a nurseryman near Newcastle, has stated in a communication to the London Labourer's Friend Society, that "wheat, sown broadcast, after *spade* culture, produced more than 58 bushels per acre; while similar land *ploughed*, produced the same season but 38 bushels. Potatoes produced eight hundred bushels per acre, being double the quantity produced after the plough, the same season, upon similar adjoining land."

"To show that I am not a mere theorist, but a practical man, I may mention that I rent a farm from the Earl of Weymss in East Lothian, consisting of 530 Scotch acres; that I have cultivated land to a considerable extent with the spade for the last three years, and that the result has exceeded my most sanguine expectations. 'As facts are stubborn things,' I shall lay before you my system, crops, expenses, and profits.

"In 1831, I determined to ascertain the difference of the expense and produce between trenching land with the spade, and summer fallowing with the plough in the usual way: I therefore trenched thirteen acres of my summer fallow-break in the months of June and July; I found the soil about fourteen inches deep, and I turned it completely over, thereby putting up a clean and fresh soil in the room of the foul and exhausted mould, which I was careful to put at the bottom of the trench: this operation I found cost about £4 10s, per Scotch acre, paying my labourers with 1s. 6d. per day: the rest of the field, which consisted of nine acres, I wrought with the plough in the usual way, giving it six furrows, with the suitable harrowing. I manured the field in August; the trenched got eight cart loads per acre, the ploughed land sixteen; the field was sown in the middle of September. The whole turned out a bulky crop as to straw, particularly the trenched portion which was very much lodged. On threshing them out I found them to stand as under:

By trenched wheat per acre, 52 bushels at 6s. 9d.		£17 11 0
To two years' rent at £2 10s. per acre, -	£5 0 0	
Expense of trenching, - - - -	4 10 0	
Seed, three bushels at 6s. 9d. - - -	1 0 3	
Eight cart-loads of manure at 4s. - -	1 12 0	
Expense of cutting, threshing, and marketing, -	1 10 0	
Profit, - -	3 18 9	
		£17 11 0

By ploughed wheat per acre, 42 bushels at 6s. 9d.		£14 3 6
To two years' rent, at £2 10s. per acre, -	£5 0 0	
Six furrows and harrowing, at 10s. - -	3 0 0	
Seed, three bushels at 6s. 9d. - - -	1 0 3	
Sixteen cart-loads manure, at 4s. - -	3 4 0	
Expense of cutting, threshing, and marketing, -	1 10 0	
Profit, - -	0 9 3	
		£14 3 6

"I now saw, that though it might be difficult to trench over my fallow-break during the summer months, it was by no means making the most of the system, as the operation was not only more expensive, owing to the land being hard and dry during the summer, but that it was a useless waste of time to take a whole year to perform an operation that could be as well done in a few weeks, provided labourers could be had; and as in all agricultural operations, losing time is losing money, as the rent must be paid whether the land is carrying a crop or not, so that in taking one year to fallow the land, and another to grow the crop, two years' rent must be charged against the crop, or at least there must be a rent charged against the rotation of crops for the year the land was fallow. As I felt satisfied that by trenching with the spade, the land would derive all the advantages of a summer fallowing, and avoid all the disadvantages attending it, I determined on trenching 34 acres of my fallow-break immediately on the crop being removed from the ground, and had it sown with wheat by the middle of November, 1832. I may here remark, that I did not apply any manure, as I thought the former crop was injured by being too bulky. As it is now threshed out and disposed of, the crop per acre stands as follows:

By average of thirty-four bushels per acre at 7s.				£15	8	0
To rent of land per acre,	£2	10	0			
Expense of trenching	4	0	0			
Seed,	1	1	0			
Cutting, threshing, and marketing,	1	10	0			
Profit,	6	7	0			
				£15	8	0

"The advantages of trenching over summer-fallow are, in my opinion, very decided, as it is not only cheaper, but, as far as I can yet judge, much more effectual. I am so satisfied of this, not only from the experiments above noticed, but from the apparent condition of the land after it has carried the crop, that I have this autumn cultivated about a hundred acres with the spade, and the crops at present are very promising. When I first commenced, I was laughed at by my neighbours, but now when they see me persevering in what they considered a very chimerical project, they are suspending their judgment, and several of them have made considerable experiments this year. I should think there are at least 250 acres under crop cultivated in this way this season in East Lothian; in 1831, the year I commenced, there was not a single acre. I have therefore the satisfaction of knowing, that I have been the means of causing £1000 to be spent this year amongst the labouring classes in my immediate neighbourhood, and I feel confident, that should the season turn out favourable for the wheat crop, and fair prices obtained, their employers will be handsomely remunerated for their outlay. I do not say that this system will succeed in every description of soil, as it must necessarily be of some depth to admit of the operation; but there are few districts where such soil will not be found in sufficient abundance to give ample employment to the surplus population of the neighbourhood.

"Now this is going on in a county where agricultural labourers *are better employed* than almost any other in Great Britain. The system was not introduced, nor is it preserved in, for the purpose of giving employment to the poor, but entirely for the benefit of the employer.

"The East Lothian Agricultural Society are now offering premiums for the most satisfactory reports on the subject. I last year received a medal from the Highland Society of Scotland for introducing the system; and what I value still more, I received a piece of plate from the labourers I employed as a token of their gratitude.

"The system, I admit, is only in its infancy, but I have this year put it completely to the test; and should it succeed as well as it has done hitherto, it must take root and spread over the kingdom; and the landed interest in those districts of England, where the poor laws are so oppressive, and still more, the Irish proprietors, will do well to investigate the system, and have it introduced with the least possible delay, that what is now a burden on their estates may become a source of wealth, and what is now a curse may become a blessing.

"This system, if it succeed to my expectation, possesses all the requisites you require; it furnishes employment for the surplus population by substituting manual labour for that of horses, and certainly if there is a lack of food for both, it is desirable that the one should give place to the other. It will make bread plenty, as the naked summer-fallows of Great Britain will be covered with grain instead of lying waste for a season; it will render corn laws unnecessary, as we will be then independent of foreign supplies; farmers will be enriched who are enterprising and industrious, and they only deserve to be so; it will raise rents, by increasing the capabilities of the soil, enabling the farmer to cultivate wheat to double the present extent; it will raise up a home-market for our manufactures, as the paupers, who are at present starving, or living a burden on the parish, will find employment, and thereby be enabled to procure the necessaries and comforts of life; it will check the poor laws, as there will then be none but the aged and the helpless dependent on parochial aid."

Stronger testimony in favour of spade husbandry cannot be adduced. Shall we venture, then, to dissent from the general principle of rejecting the plough for the simple spade? Yes, to a certain extent. We must maintain the incomparably greater value of the more complex implement to the *large* farmer, while we as strenuously maintain that the spade alone should be employed by the *small* one.

The poor man's capital consists in his individual labour, or in the combined labour of himself and his family; and accordingly as he applies this with assiduity to his land, will be his independence and profit. By the use of the spade he probably obtains one-third more than he could derive from *such ploughing* as he might be otherwise expected to effect; he saves the expense of horses, while he keeps cows instead, to produce milk and butter. He saves seed by the superiority of tilth and cleanliness obtained by digging, and the regularity with which the shade covers the seed. He gradually deepens and improves the staple quality of his soil by trenching a portion of his field every year, which occasions the incorporation of a portion of the under with the upper soil.

As regards *potato culture*, the produce is so much increased by digging deeply between the drills and about the roots of the plants (besides the increase of succeeding wheat) that we would urge the spade even on a *large** scale of operations for *this* crop. The labourer or small farmer, who, after experience of the spade in this instance, uses a plough, is an extravagant fool. It is owing to trenching with the spade, to regular and perfect digging, that the clover crops are so astonishingly clean and productive in Flanders, with so little seed. The roots have room to penetrate and expand, and the seeds or roots of weeds are—where they ought to be—safely interred at the bottom.

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* The headlands are, in this case, treated equally with the rest of the field, consequently there are no trampled and broken stalks, nor any waste land.

The mode of management by digging and trenching on a small farm in Flanders, ought to be generally understood in Ireland.

> " A good labourer can trench four perches of land, each perch being the square of five and a half yards, in a day, or dig eight perches. It will take him, therefore, seventy-eight days' labour to trench one and dig three more acres: one being in clover does not require it, and that which had potatoes before is prepared by digging them up. His wife and children carry the clover, which he cuts after his day's work, and weed the crops. The digging for wheat and rye is done in the autumn, beginning with the land cleared of colza; the hacking the stubble for turnips and sowing them makes a variety in the toil, this not being so laborious. The trenching is done in winter, and at any spare time between harvest and spring. The wheeling of manure, harrowing, sowing, digging out water-furrows, and reaping the corn on three acres, will take forty-five days' labour. An acre of potatoes on the trenched ground will require twenty-four days' work to make ridges, plant the sets, mould them up with the hoe, and take them up. The turnips after rye will require eight days to hack the stubble, harrow it, and sow the seed, and four days, with the help of the family, to pull them and wheel them to the root-cellar, for they are never left in the field in winter. Allowing five days for cutting the clover and making a portion of it into hay, we have found work for one hundred and sixty-four days, which, to include various smaller operations, we shall reckon altogether two hundred days' work out of doors. The remainder is amply sufficient to thresh out the produce, prepare manure, assist his wife and children in feeding the cows and pigs, and weave occasionally. The flax, being generally sold standing, and pulled by the buyer in summer, does not interfere with the farmer's labour. The weeding in spring is done by the whole family, and neighbours mutually assist each other.
>
> "In a farm of ten acres entirely cultivated by the spade, the addition of a man and woman to the members of the family will render all the operations more easy; and with a horse and cart to carry out the manure, and bring home the produce, and occasionally draw the harrows, fifteen acres may be very well cultivated."*

In the Waes district of Flanders—

> " Supposing the whole extent of the land to be six acres, which is not an uncommon occupation, and which one man can manage—one acre is trenched twenty inches deep every year, well manured with the dung and urine of cows, and planted with potatoes, part of an early kind and part of a later; as the land is ready from the beginning of April to the end of May, if the soil be fit for wheat, this is usually the next crop; if it is too sandy, rye is sown instead. The taking up of the potatoes gives a sufficient tillage for the wheat or rye. * * The first object of

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* Outlines of Flemish Husbandry.

the spade farmer is to procure food for his cows, for without them he cannot have manure enough—he must not merely have a bare sufficiency for them, but he must have abundance; for if the food of the cows fails, his whole process is impeded. He must then either sell some of his stock or buy fodder at a ruinous expense. If he has too much, he will never be at a loss how to dispose of it. He must also have food for himself and family. It is calculated that each grown individual consumes in the year—

6 bushels of rye,
3 ditto, wheat,
3 ditto, buck wheat, } or 12 bushels of grain.
14 ditto, potatoes,
48 lb. of butter,
1 cwt. of pork, and
2 quarts of butter-milk or skim-milk per day.

"If a man with his wife and three young children are considered as equal to three and a half grown up men, the family will require thirty-nine bushels of grain, forty-nine bushels of potatoes, a fat hog, and the butter and milk of a cow; an acre and a half of land will produce the grain and potatoes, and allow some corn to finish the fattening of the hog, which has the extra butter-milk; another acre in clover, carrots, and potatoes, together with the stubble turnips, will more than feed the cow; consequently two and half acres of land is sufficient to feed this family, and the produce of the other three and a half may be sold to pay the rent or the interests of purchase-money, wear and tear of implements, extra manure and clothes for the family. But these acres are the most profitable on the farm, for the hemp, flax, and colza are included; and, by having another acre in clover and roots, a second cow can be kept, and its produce sold. We have, therefore, a solution of the problem how a family can live and thrive on six acres of moderate land."*

We have also *innumerable* proofs, in Great Britain and Ireland, of the incalculable advantage of spade husbandry and cow-keeping on *small* allotments. A recent instance has come to our own personal knowledge, which ought to stimulate the landlords of the country to promote spade husbandry, under *proper instructions*, among their labourers and small farmers.

On the verge of the demesne at Johnstown, (county of Wexford,) the property of H. K. Grogan Morgan, Esq. there are thirteen allotments not exceeding two acres each, which are cultivated on a prescribed system and under the management of an agriculturist kept for the exclusive purpose.

During the last year, this manager, Mr. Pidgeon, contrived to clear† £14 16s. on three roods; exemplifying the maxim of Solomon, "that much food is in the tillage of the poor," if that tillage be properly conducted. The value was thus stated to his employer:—

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* Outlines of Flemish Husbandry.

† Rent, however, not included.

PRODUCE.

Profit of milk and butter of *two* cows for one year,	£14	0	0
Two calves, from ditto,	1	1	6
Drumhead cabbages, sold,	1	4	0
Two barrels of barley at 16s. per barrel,	1	12	0
Value of straw,	0	5	0
	£18	2	6
Expenses,	3	6	6
	£14	16	0

EXPENSES.

Paid for labour,	0	7	6
Vetch seed,	0	3	4
Clover seed,	0	3	0
Mangel wurzel,	0	2	4
Cabbage seed,	0	1	0
Rape seed,	0	0	4
Barley seed,	0	4	0
Hay, for winter feeding,	2	5	0
	£3	6	6

Mr. Pidgeon had three other roods under potatoes and oats for his domestic purposes, which produced nearly as much gain; he had also a profit of £3 on two pigs also fed on the premises, and not taken into the foregoing account; and 100 loads of manure, which could not have been the case but for the house-feeding of the cows, the green-crop system, and *spade husbandry.*

We have thus readily conceded every point which the advocacy of culture by the spade involves, as far as tillage on a *small* scale is in question; but we cannot concede the application of the same principle beyond a narrow limit; and in this, as in numerous similar cases, we must guard against the error of *generalizing* principles without taking into consideration the combination of circumstances under which the application of them must be made.

Under the former circumstances, there is in the first place no stipendiary labour; the occupier is his own labourer, and with motives to industry which would not actuate mercenaries; and in the next place, though the spade is the best tool in the hands of the small farmer, who cannot afford to purchase effective implements and the cattle necessary to draw them, it is by no means the fact that improved ploughs, (subsoil and trenching ploughs, especially, included,) with harrows, cultivators, &c., cannot pulverize and prepare the land *perfectly* well.

The same reasoning which tends to prove the advantageous results of machinery in general, applies in reference to agricultural implements; but *such machinery* as the great farmer can command is totally out of the question with the small farmer; his scale of husbandry prevents the outlay of any capital for the purchase of complex implements; and even if he had the most effective plough or cultivator, how is he to obtain the animal or other power requisite for working them?

On even an extensive scale of farming, we recommend spade husbandry in *potato or cabbage culture*, but not for general crops. However gratifying to the benevolence of an individual farmer it may be, to employ a vast number of men to dig his land, in preference to the usual course of plough and horse labour; he must consider that there is a limit beyond which he cannot multiply his labourers without occasional inconvenience and perplexity to himself, and without *unceasing superintendence.* Should any of the numerous causes which may occasion a change of occupiers on a given farm, or a change of *system* occur, what is to become of the numerous families collected by an individual, who has largely introduced the practice of manual labour and confined his operations to that system alone? What is to become of an excessive population of agricultural labourers, if their services be no longer required by the successor of the spade husbandry farmer? If any one replies, "Oh, let the system be generally introduced, and there can be no danger of their want of employment somewhere;" the answer is plain. If you substitute the spade for the plough to such an extent, you raise the price of labourers beyond what you can afford to pay, and you diminish the chances of success in your general farm operations, by giving up too much time to one department of labour. Time is money to a farmer; let him lose a week in a critical season, and the delay may be highly injurious to him in many respects. Promptitude and despatch are essential to his completion of farm-labours at the proper times: without the aid which improved machinery affords him, it would be utterly impossible for him to get through his work in due course. Let him abandon the more rapidly working plough, and take the tedious spade, and he will soon heartily regret his exchange. After what we have premised on this subject, it is almost superfluous to repeat, that if these latter remarks possess any accuracy at all, they are merely true in their application to *large* farmers, and not intended by any means to affect the subject as it is connected with the cottier or small farmer, who has rarely any capital but his labour, and "needs no other if he be suffered to use it freely and fairly." What is the limit, then, to the capital of his labour? What sized farm should he have that will make it the most productive? Why, the exact amount, and no more, to which he can apply all his capital. Has he a family, he may then have more capital of labour to bestow by their assistance; consequently a larger allotment* will be needed to employ all the capital of more extended labour. If he be single, then less, of course, will better suffice.†

Mr. William Chambers, describing the happy and independent condition of the Belgian peasantry in consequence of the division of land into small farms suitable for the management of individual families, and referring to manual labour, says :—

> "Pleasing, however, as is the prospect of such rural industry and comfort, it is of importance to represent that the system of agriculture is not according to a right state of things, as far as regards the general benefit of the community. The practice of executing all the operations of husbandry by the hand is utterly adverse to the cheap production of food, and cannot be tolerated in an advanced state of society. If land had been created to feed peasantry only, the Belgian system would be entitled to unmeasured commendation. But such, it may be presumed, was not the case. The whole population of a country is as much interested in the soil as the mere labourers upon it; and hence the necessity for producing the largest quantity of food at the cheapest cost to the community at large. This is a point too much neglected in all discussions on the subject of agricultural labour, and should be fully borne in mind in estimating the condition of the peasantry and farmers of Belgium or of any other country in similar circumstances."‡

SPURRY—A small annual weed, of the pink tribe, which grows chiefly in corn fields of a dry, sandy nature.

In Germany and Flanders it is sown sometimes, in consequence of its rapid growth, as an intermediate crop between the harvest and spring sowing, but generally after harvest; the quantity of seed, which is small, (lightly harrowed in,) is about ten pounds per statute acre; it attains its height (twelve or fourteen inches) in a few weeks, and supplies food, at little cost, for milch cows, till the frost sets in.§

STACKS.—These ought to be neatly and safely built in the stack-yard (which should not have a high wall or trees about it) on pedestals (see *Corn-Stands*) of cast-metal, blocks of stones, or wood, laid across upright posts, and projecting so as to prevent vermin from climbing up; or, on square or circular walls, arched above, or with transverse beams and intersecting walls, under which ducks and geese can be comfortably lodged.

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* He should never have more than he can fully till by his labour; if his capital of labour will only do justice to *half* an acre, and he has a whole one, he is paying two rents for one produce, that is, the rent of one acre out of the produce of half an acre. The same argument applies to all cases, *great* as well as small. (See Labourer's Friend.)

† The Labourer's Friend.

‡ A Tour in Holland, the countries on the Rhine, and Belgium in the autumn of 1838.

§ *See Radcliff's* Flanders.

In England it is common to house the corn in great barns; but in this way it is apt to become musty, and to suffer from the depredations of rats and mice.

The best form of a stack is the circular with a diameter of twelve or more feet.

"The manner for working it is this:—A circular layer of straw, or other substances, is laid, to form the bottom. The workman begins by placing a sheaf upright, in the centre of the intended stack, round which he places other sheaves, also on their butt-ends, with the tops inclining inwards; and this he continues to do in regular courses, the sheaves being placed closely together, until he nearly reaches the outside of his foundation. He then lays an outside layer all around, the butts being outwards, with the top and upper half of the sheaves resting upon the inner ones. In this operation of laying the exterior layer, he first grasps a sheaf, and then placing it close to, and somewhat upon, the sheaf last laid, he presses upon it with his hands, and the weight of his body, and lifts himself forward, until he has placed his knees upon it; and then, grasping another sheaf, he, in the same manner, places it in its position, and so moves on from sheaf to sheaf. He thus lays a layer of sheaves all around, and then a second layer, in the same manner, filling up, where necessary, the interior of the stack, until he has raised the whole nearly to the same level as the top of the upright sheaves before mentioned.

"Having completed this first part of his work, that is, having laid his outside layers, and filled up the heart, so that the whole may be nearly level, but with a slight dip from the centre downwards, he proceeds thus:—He lays his second course of sheaves all around, with their butts about 15 or 18 inches further back than those of the outside course. Having done this he fills up the interior of the stack; but in filling up the interior, he does not generally observe the same order of courses which he does in laying the outside layers, he merely packs the sheaves in a proper manner, so that they fill up the whole interstices. He now lays an outside layer all around, with the butts outward, as before, and the ear-ends slightly elevated, by resting upon the butts of the last laid or inner course. Thus he proceeds, alternately laying the outside and the inner course, and filling, as he proceeds the heart or interior, carefully preserving, as has been said, the dip of the sheaves from the centre outwards.

"Sometimes, when the stack is very large, or the straw short, more than two internal courses are laid. The process, however, is the same. The different courses overlap, and the workman proceeds by laying the courses in succession upon each other, and filling up the heart."*

Stacks should be thatched immediately after they are made, before any rain falls upon them.

STACK-YARD.—(See *Corn.*)

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* Low's Elements of Practical Agriculture.

STANDS.—(See *Corn Stands.*)

STEAMING APPARATUS.—The preparation of food by steam, for fattening milch cattle, working-horses, swine, poultry, &c. is now of such frequent practice as to render it important to have a suitable apparatus, of the simplest and most economical construction. A common boiler (set over a small grate) with a ledge on which to rest a barrel with a perforated bottom, and a crane to raise it off, and turn it upside down, for discharging the contents, answers perfectly well for potatoes and other roots on a small scale.

In the Farmer's Magazine there is a description of a boiler and wooden box placed over or near it, so as to be emptied by barrows in the easiest manner, either by the end or top. A box 8 feet by 5, and 3 deep, will hold a sufficient quantity of potatoes for 50 cows, for 24 hours, and these may be steamed in an hour.

In Drummond's manufactory, steam machines of different sorts and power are made on terms within the reach of every farmer. See *Implements.*

STRAW-CUTTER.—An implement for cutting hay and straw into chaff for cattle. This is either a jointed chopping-knife, simple and cheap, or a more complex machine, in which the cutters or knives are made to revolve by being attached to a cylinder on the shaft of a fly-wheel, while the straw is gradually pushed forward by means of feeding-rollers, through a box or trough, on the outside of which it is chopped off by the blades or cutters. There is much saving of food from the use of these cutters. See *Horses.*

STRAW-YARD.—This enclosure, in which cattle are confined in winter for the purpose of being foddered on straw, and so important an appendage to every farm establishment, should be open to the south.

Some people are so heedless of the comfort of the poor inmates, as to have these yards without any shelter except what the walls afford. There ought to be open sheds; for though pure and open air is essential to the health of store and working cattle, cold air and rain are highly injurious to them.

The great use of a straw-yard is for the accumulation of manure, which cannot be rich unless the cattle get some food besides straw to support them. Mr. Stewart feelingly deplores the miserable state of horses turned into straw-yards for the renovation of health, or the benefit of their limbs, without any of the comforts of food or lodging to which, in their previous state, they had been accustomed.

There should always be a range of sheds on the north side (or adjacent ones near) else a straw-yard is a prison of the most miserable description. Indeed without sheds, and the means of occasionally separating the cattle, the stronger will often domineer over the weaker, or perhaps injure them fearfully with their horns.

STUBBLES—" A good stubble is the equallest mucking that can be given," said Lord Belhaven, formerly, when he recommended the farmers of East Lothian to leave a large portion of their straw upon the ground. It was the practice at the period when his lordship gave this absurd advice, to apply little straw to the purpose of bedding cattle, and consequently to the accumulation of manure; all of it that could be eaten was dealt out frugally to cattle as food, and generally on the field, where the dung was consequently wasted. Under modern improvement the straw is cut as low as possible, either in the first instance, or by close mowing after the sickle has cut high. It is needless to remark, that the straw of culmiferous crops can never be so profitably used for farm purposes, as in absorbing the excrementitious matter of cattle, especially when enriched by green food and turnips, and made to undergo the necessary degree of putrefaction and fermentation. See *Manures.*

SWINE.—The hog is a well known quadruped in his domesticated state, extremely useful to man, with whom he may be associated in every climate in the world.

According to Buffon, this is the most brutish of animals; its imperfections of form appear to affect its general nature; its habits are gross in the extreme; its tastes impure, all its sensations are brutally sensual; its voracity is the consequence of the immense capacity of its stomach, which causes it to devour indiscriminately any thing presented to it—even its own progeny sometimes. It certainly has little delicacy or refinement of sensibility in any particular. Even to blows moderately inflicted it is rather insensible, from the toughness of its skin, the thickness of its fat,* and the harshness of its bristles; its feelings are dull, nor are its tastes less so. But the quick sense of hearing, with which this brute is gifted, and its quick perception of the variations of atmosphere, (it is an unerring barometer for prognosticating a coming storm,†) and sagacity in many other respects prove that the hog is by no means a fool, nor even stupid.

The above description of this animal, as to form, certainly does not accord with our notions of beauty. His head is long, the end of the snout (a cartilage which encloses a small bone) is small in proportion to the grossness of the head, and the hind part of the neck very elevated, which gives his head a poking direction. His eyes are so small and so deep set in his head, that his physiognomy would have no expression, but for the tusks at each side of the mouth, which cause the upper lip to recede, at the same time giving it a curl upwards, indicative of ferocity, as these tusks are his arms of attack or defence. Nor is his body more lovely than his countenance; his neck is so short and thick, that his head almost touches the shoulders, and this is carried so near the ground as not to allow his breast to be seen. The fore legs are so short that he appears obliged to droop his head to rest on them, and all his body appears falling forward. His movements are very ungraceful, as he has no pliancy in his legs, and hardly bends as he walks or runs; his quick gait is remarkably constrained.*

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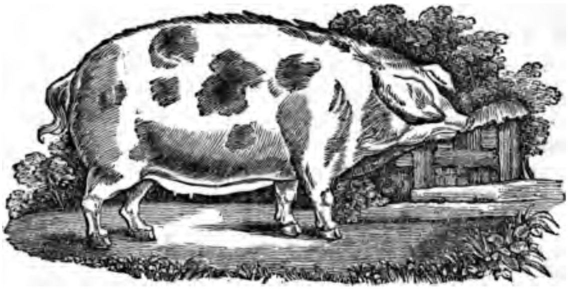
* We believe it is the same naturalist who says that mice have been known to burrow in the hog's carcase without his perceiving it!!!

† This he indicates by running about restlessly with straw in his mouth, and other symptoms of feverish agitation.

The wild boar, which was the parent stock of all the European varieties, and also of the Chinese breed, was formerly a native of the British islands, and until the time of the civil wars in England was found in the new forest of Hampshire.

The tame boar, kept for breed, should be selected with care from the best breeds. All points and qualities considered, the Berkshire species seems to be the most desirable; for although the Shropshire and the Herefordshire, (on account of the great size which they attain if well kept,) and the Hampshire, are highly valuable, they want the compactness, and natural tendency to fat which so remarkably characterise the Berkshire breed. The colour of this breed is tawny-white, or reddish, with black spots; the legs are short and fine in the bone. The cross from the Berkshire (which is only third rate in point of size) with the heavy, slow-feeding sorts, like the old Yorkshire, and the Irish, long-legged, lank-sided breed, has effected surprising improvement. The plate exhibits the most desirable animal of the hog class.

THE BERKSHIRE SOW.



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* See MS. in the library of the Royal Dublin Society House.

The Irish pigs which were formerly proverbially ill-formed and hard to fatten, are now generally of a good fattening description, attaining at an early age the moderate weight of two cwt. or two and a half cwt., which bacon curers find to be the most desirable.

There are, in England, many favourite varieties called after the counties in which they are respectively bred, but not requiring particular details.

The Chinese breed (which Mr. Culley subdivides into seven varieties) for domestic purposes, is very useful, and has been much crossed with the British species. The range of the yard soon fattens this diminutive breed, which trails its belly on the ground, and soon becomes fit for pickling. As porkers, they are very good; but for bacon and flitches they are obviously the least desirable kind.

The selection of the boar and sow must be regulated by the object for which their produce is designed; if for flitches, the sow should be rather large, with a large and deep carcase, but small bone, which gives the least offal, and of fine skin. And the boar should be compact in form. The boar and sow may be allowed to engender when about a year old, (or sooner as respects the sow,) and kept breeding according to convenience, for three or five years; but it is hard to fatten them at this age, and their flesh becomes very coarse, and wastes in boiling. Many persons take one brood at an early age from each of the sows of any litter, allowing them to engender at nine months; and then they fatten them as soon after farrowing as possible. They maintain that the growth of the sow is not materially checked, and that by being in *profit* while she is in feeding, the return is greater than if she were spayed. The first litter of a sow being rarely large, if she be highly fed—and not allowed to nurse for more than three weeks, when her progeny may be sold for the table—her condition is not much impaired by farrowing and nursing; and even if she nurses the greater part of her litter for six weeks, she may be speedily fattened for the shambles.

The sow, kept altogether for breeding, should have two litters every year; she may have five in two years. Her period of gestation is four months; and she will immediately receive the male after the litter is taken from her; nay, sooner. Sows have been sent to the boar on the ninth day after farrowing, which gains considerable time in the course of propagation. The period allowed to them for nursing (when the progeny is to be reared) is six or seven weeks. Care should be taken that the sow farrows early in spring and September, in order to have the young ones, which are very tender in infancy, weaned in genial weather, and when green food can be had. If the object be to rear sucking pigs for roasting, care must be taken to have them at all seasons. It is considered injurious by many to feed the pregnant sow *abundantly*. The lower orders of the Irish peasantry are obstinately prejudiced against giving the poor brute a sufficient allowance of food even during any period of her pregnancy, thinking that the number of her litter would be diminished by full feeding; (the stinting in food, however, to promote conception, should be observed for ten days or a fortnight, but after this, no limitation should be observed;) the Irish small holder's brood sow is consequently a miserable framework of bones when endeavouring to nurse a large family, and of course less likely to prove again prolific with the promptitude which would result from a sufficiency of proper food. Indeed she rarely has two litters within *fourteen* months, from the condition in which she is kept, and the want of milk for the weanlings, which renders it necessary to leave them for eight weeks with the mother. They are not saleable in the markets sooner, and cannot be weaned in proper time, from the deficiency stated. Care should be taken to separate the sow from the rest of the herd when near her *confinement*, which will be intimated by her restlessness, and to afford her a bed of *short* straw, and in very limited quantity, lest the young ones should be smothered. The same person should feed her for some time before farrowing that she may be reconciled to his attendance, during her parturition, if necessary. Many casualties affect brood sows and their offspring; were it not so, the increase of the species would be still more enormous than it is.

The number at each farrowing varies a good deal, but it is greatest in the small varieties. It has been estimated that twenty sows on an average will produce in the first litter seven and a half each; many more on succeeding occasions. If the mother should produce more than one for each teat—which occasionally happens—the supernumeraries must of course be removed, and fed with warm milk from the dairy. The sow, after farrowing, should have milk-warm food for a few days, and sparingly, to guard against fever. Young pigs will pick up scattered corn and boiled potatoes when they are three weeks old. When they are first weaned, their food should be milk-warm; and if milk be scarce, oatmeal or bean-meal porridge; or potatoes, with milk. Oatmeal (or ground oats) forces their growth considerably. If they are not designed for breed, they are usually *incapacitated* by an operator a week or ten days before they are weaned; some, however, prefer leaving the *males* unmutilated until they are six months old.

The number of pigs kept should be determined by the size, and circumstances, and local resources of the farm. If there be a dairy and a *good run*, on pasture fields, bogs, woods, or the sea-shore—where store pigs may roam at large without injury, and principally support themselves, on grass, roots, hips, haws, acorns, or shell fish—or a distillery in the vicinity, they may be very advantageously maintained to a considerable extent, and with little or no outlay of capital. *Close* confinement will not answer for young or store pigs; they must have a range of pasture to render them properly productive. If, confined, however, in straw yards, they will greedily consume clover, vetches, beet leaves, and even raw* potatoes and turnips if they can get nothing better to eat. What other and more fastidious animals would reject, they will thrive upon, provided whey or some sort of milk, or distillery wash be supplied to them. From the capaciousness of the stomach, there is a perpetual craving. In short, to sum up his character, the hog is a scavenger by nature, and ever ready to remove out of the way (his stomach being the receptacle) whatever might offend other animals, and this without ever being sick, or troubled with indigestion from his voracity. Yet with all his *beastliness*, ill manners, and want of *taste* and sensibilities, if he has a choice of food he has sufficient discrimination to distinguish and prefer what *he* considers delicacies, as well as hogs of another genus. His gluttony and drowsiness are, in reality, virtuous dispositions in him; for these qualities lead him to eat to excess when he can, and his duty clearly is, to get fat (or as the French politely term it *embonpoint*) as fast as he can.

Vast herds *used* to be supported in the dairy districts of England on clover, and milk, or whey—we say *used*, because we refer to "sixty years since."

It is amusing to compare the former with the present circumstances of the English markets, as far as the breeding of swine is involved. In 1780, eleven malt distillers in or near London, fed and fattened 25,000 hogs. Four starch manufactories fed 3000. In the same year 35,000 were driven from some of the midland counties of England to London. In 1820, the number calculated for the same districts was only 3000. The same proportions held at the same time as to porkers sent to market from the dairy counties. Ireland is now, more than at any former period, the great store-house of swine for the supply of England. The Irish peasant, from the peculiar condition of his country, has a decided advantage over the Englishman of the same class, in the facilities for rearing pigs and poultry. The latter has rarely even a rood of land, and no permission to make a common of the road. The Irishman has an acre at least, besides the privilege which he contrives to exercise, of grazing his pig upon the road side; the small farmer (a character unknown in England) has the means of keeping a brood sow and some store pigs; and the insatiable craving of the British appetite for bacon and pork creates a continual demand. The English labourer, from the different way in which he lives, and the want of accommodation for pigs, (consistently with his habits of cleanliness, and of respect for the laws against trespass,) can rarely enter into the competition at all, and if so, at the disadvantage of at least twenty per cent.; for the offal of the Irishman's potatoes supports his pig without any additional cost whatever.

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* Where there is a steam apparatus, all food should be steamed. This promotes growth surprisingly.

The English farmer, except, perhaps, in some dairy counties, finds it more convenient and agreeable to his taste to apply his agricultural produce to the feeding and fattening of stock of another description; or if he occasionally fattens a lot of swine, he purchases from the traders who import them from Ireland.

The Scotch labourer, indeed, has advantages somewhat similar to those of the Irish cottier in this respect, as he is often allowed by his employer to keep a pig, and this at very little expense. The Irish, however, merely *rear* swine well; they do not properly fatten them for bacon.

It is true, that potatoes, (boiled or steamed,) with the addition of a little sour milk, will fatten *perfectly* well, and render the meat firmer than that which is fed on barleymeal, though this will put on more flabby fat; but in Ireland the pig gets only the refuse of potatoes, and no milk from the poor man. He should have raw corn or peas for three or four weeks before killing, to make the fat perfectly firm; but this he rarely gets in Ireland. Milk conduces greatly to the good condition of a pig; this is proved by the clean and rosy-coloured condition of his skin, and of this beverage he is very fond; but beanmeal or shelled corn is considered too expensive a food, even mixed in small quantities with potatoes, for pigs intended for the market, though this food greatly promotes the fattening.

When milk is scarce, an excellent substitute may be found in porridge, made of oatmeal or beanmeal. One pound of either, will thicken five quarts of water to a very *substantial*, and nine quarts to a *gelatinous* consistence; in no way can meal be so economically afforded, either for forcing the growth of pigs, or for fattening them.

For his family use—the farmer is prudent who renders his bacon of prime quality by feeding; but under any circumstances he will find farinaceous potatoes at least the best general food. (See *Bacon.*)

The sties and yard should be kept perfectly clean and dry, and well supplied with fresh straw; and the trough should be frequently washed.

This indispensable appendage should have parallel bars of iron affixed to the sides, and to a transverse bar, (if the trough be oblong in form,) at such a height as will give the pigs head-room, and at such distances from each other as barely to allow each animal to reach with his nose the bottom of the trough without putting his feet in also, as he usually does in his eagerness to obtain the greatest possible share of the feast, and to exclude his more ceremonious or less pushing companions.

Hogs will not fatten to full size before they are at least eighteen months old; but porkers of improved breed, if *well fed* from their infancy, and allowed their liberty, may be killed when six months old. They are then very delicate in flavour.

The diseases of pigs arise from foul feeding, and dirty, wet beds, and they are very intractable patients.

Fortunately, they will generally eat even when sick; and aperients, such as salts, sulphur and antimony, may be given in their food, for measles, and other disorders arising from an impure state of the blood. Strong beer and peas-porridge are recommended as tonics. If they will not eat there is no remedy for them.

Swine are very liable to a sore swelling of the glands about the throat. In this case, the best operation is to open the swelling with a razor, (taking care not to cut the throat,) to probe the sore, and to leave an orifice about an inch in diameter. A dressing of fine salt and hog's lard or cart grease, applied to the sore once a day, will heal it in the course of a few days.

Salt is reckoned one of the best remedies for all wounds and hurts, as it checks the venom; if mixed with ground ivy, leeks, or other similar vegetables, it is a universal remedy for the sores of swine.

Imposthumes often affect the legs and thighs of young pigs. Open them with a knife, squeeze out the corrupt humour, and apply salt and lard.

When a hog receives a violent stroke that injures some blood-vessels, a considerable swelling takes place, and the blood does not circulate. The mixture above stated will effect a cure.

Swine are sometimes surfeited, or injured by eating slightly poisonous matter; in this case they refuse food, are constantly lying down, and sometimes have the stomach swelled. In this case give six ounces of fresh butter, with two heads of garlic incorporated with it, every six hours until relief is obtained.

TAP-ROOT—That which shoots directly to the ground.

TARE—A species of vetch. There is a material difference in the constitution of winter and summer tares, though not in appearance; but if imposition be practised by the seedsman, it is easily detected when the blade appears. The winter vetch vegetates with a fresh green seed-leaf; the other has a brownish hue, and a grassy spear-like leaf. The proper time for sowing winter tares is as early in autumn as possible, as a lesser quantity of seed suffices in this case, and an early cutting in the spring is of importance. From two and a half to three bushels of seed per acre is sufficient, if the land be—*as it should*—perfectly clean. Some persons manure for their vetches; so much the better, if they can, but this crop will succeed very well without it, if sown early and in clean land. After *early* potatoes, and without any fresh manuring, it is certain of succeeding perfectly, and in this case may be sown in the middle of August, either under the harrow, broadcast, or in drills, if the land be gravelly or sandy. In every circumstance the crop should be kept dry during the winter.

Turnips, on dry soil, may succeed either spring or winter-sown vetches, with great effect, or rape or wheat on heavy clay land. No crop cleanses the ground or ameliorates its condition more than vetches, which ought to be more generally cultivated as an intervening and renovating crop. By overshading the land in spring, they prevent weeds altogether from springing up, or these are cut down if they do grow, before they ripen their seeds. *Two* crops in the year may be obtained by sowing vetches, as before stated, either after early potatoes, or on rich stubble land, immediately after harvest. Being cut in the ensuing months of May or June, the land can be prepared for turnips without any loss of time. Tares should be always sown, in some proportion, to succeed between the first and second cuttings of clover. In a dry summer, when pasture is scarce, they are of great value, from their extreme succulence and nutritious properties. They are excellent for causing a secretion of milk, and store-pigs thrive upon them as well as upon any food that can be given them. A prudent farmer will save his own seed, to insure the proper distinctions of spring and autumn vetches.

TETHERING—The practice of confining to precise limits on pasturage, any kind of stock, by means of light chains or ropes fastened to iron pins (with swivel rings) driven into the ground.

This mode applied to horses on military service is termed *picketing*.

The length of chain for a sheep should be three yards, and five for a cow. There should be two or three swivels in the chains besides those at the extremities, and they may be attached to the animals either round the neck, or by one of the forelegs, by a leather strap. By changing the plots once or twice (according to the luxuriance of the grass) in 24 hours, there is a constant succession of fresh herbage.

Upon the glebe-farm of the late Rev. Richard Radcliff, at Enniscorthy, there were some years ago three compartments of his lawn devoted to this management.

			A.	R.	P.
No. 1,	containing	(plantation measure)	0	3	27
„ 2,	do.	do.	0	3	20
„ 3,	do.	do.	1	0	20

Upon 1 and 2, seven milch cows were tethered, day and night, for five weeks, from May 14th, to June 18th, inclusive.

Upon No. 1, the cows were succeeded by fourteen sheep, kept thereon for eleven days, and in ten days after the grass was fresh and luxuriant.

Upon No. 2, the cows were immediately followed by a two-year-old heifer, and two yearlings.

Upon No. 3, fifteen sheep were tethered on the 24th of March; to that number were added on the 4th of May, thirteen sheep; still added on the 18th of May, four sheep; on the 20th of May, a work-horse and a mule, and two calves; on the 18th of June eight additional sheep; and from those respective days to the 27th of June, all the foregoing stock were continued upon No. 3, except three wethers killed for the table, which, however, were replaced by three store-sheep.

So that, upon 2A. 3R. 27P. 40 sheep, 7 ewes, 2 calves, 1 horse and 1 mule, were supported for the above period.

The dairy-maid was perfectly satisfied, as the cows, which were in high condition, gave as much milk and butter upon this regimen as upon any other.

The constant manure which this land received from its numerous stock, caused a daily reproduction of sustenance by a forced and increasing vegetation.

For the *small* farmer, with indifferent fences, or for gentlemen with limited and ornamental lawns, this practice, which secures shrubs and pleasure-grounds from injury, is obviously often an advantageous practice; and indeed a *rich* lawn immediately in view of a house is the fittest situation for tethering, as an impoverished field would disappoint, and demand a too frequent, and therefore troublesome, change of tether.*

THATCHING. See *Cottages.*

THISTLE.—Of this very vivacious weed there are many varieties. The "corn" or "way thistle" is that which annoys us chiefly. The "sow thistle," distinguished by its tall stem and unprickly leaves, is not very troublesome, and is excellent for store-pigs. If the least part of the root of the thistle be left, it springs up, season after season. Besides possessing this principle of vitality in the root, its seeds are so winged with down, as to render dissemination, even to a great distance, by means of the wind, almost certain. It should never be allowed to seed. When in old pasture-land it should be kept closely mown, and if some salt be put with the finger to the cut stalk, it will probably destroy the plant altogether. Weeding-knives are usually employed to cut the plants *close* to the ground, but unless salt is applied, they spring up again. The best way is to extirpate them altogether by weeding-pincers, or the finger and thumb, when in loose earth. But a course of good tillage will alone perfectly eradicate them. They often spring up in fresh land very abundantly, and if neglected will take entire possession of the soil. Professor Low says, that they were once so abundant in Scotland, that they used to be cut regularly for five or six weeks in summer to supply food for the wretched cattle of the day. The modern Scotch husbandman does not pique himself on the thistle, and has certainly now far less legitimate claim to it as a national badge than the Irish farmer. The presence of a *luxuriant* thistle, however, indicates strong land.

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* See Irish Farmer's Journal.

THRASHING or THRESHING—The operation of separating corn or any seed from the straw.

"Gideon thrashed wheat;"* not with oxen,† on the occasion referred to, but with a stick or pole; and a pair of sticks, connected with a thong of leather, is to this day the implement in use among all who farm on a scale not sufficiently extensive to require any of the complex machinery which modern skill has invented.

The advantages of the flail are, its simplicity, the power of giving employment to the labourers in the barn during wet days, when they could not work out of doors, and the convenience of having fresh straw for fodder every day.

To the farmer on an extensive scale, the threshing-machine is absolutely necessary; he cannot wait for the tedious operation of the flail, to prepare a lot of corn for a given day, or pressing purpose; nor can he, without the risk of perpetual pilfering and imposition, keep his barn constantly open for threshers.

In one of the agricultural works quoted by Loudon, it is asserted that the quantity which a labourer can thresh in the day, by the flail, is in general from one to one and a half quarter of wheat; of barley from one and a half to two quarters; and of oats about two quarters. This appears to us, as regards wheat particularly, a high average of human power. It is considered fair work for an Irish thresher (and no man works harder by impulses, or on task labour) to thresh out clean, 20 stones of wheat, at 14lbs. per stone, per day; 32 stone of barley or oats; and few men will, in the short winter days, thresh much more, for any considerable time.

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* Judges, vii. 11.

† Oxen have from the earliest ages executed this work in many countries of the east, where, from the heat and dryness of the climate, the grains do not adhere to *the stalk so firmly* as in our climate.

The first effort at the construction of a threshing-machine was made by a Scotsman of the name of Michael Menzies of Edinburgh, in 1732.

> "It consisted of a number of instruments fixed in a moveable beam and inclined to it at an angle of ten degrees. On each side of the beam on which the flails were fixed, floors or benches were placed for spreading the sheaves on. The flails were moved backwards and forwards upon the benches by means of a crank fixed on the end of an axle, which made about thirty evolutions in a minute."*

The flails were soon smashed, and therefore that machine was very imperfect; several machines were subsequently constructed on various principles, but they were more or less defective. Mr. Andrew Meikle, of East Lothian, after much unsuccessful labour on the *flail* principle, at length hit upon the true plan, of two revolving *rollers*, between which the sheaves pass. He obtained a patent, and has all the merit of the contrivance, though the machine has been since brought by others to much greater perfection.

These machines may be had from two to six horse-power, and it is needless to say that the advantage of preparing forty or fifty quarters of grain in a day is prodigious, particularly if water can be substituted for horse or steam-power; indeed the severe labour to horses is a very serious objection to the use of a threshing-machine worked by them, even though a contrivance has been effected (by Mr. Walter Samuel, of Niddry) for making the horses pull with equal, continuous, and combined effect.

TRENCHING—The operation of pulverizing and deepening the soil, (to a greater depth than is attained by ordinary digging,) by reversing the relative positions of the different strata.

This practice, which prevails in Flanders (see *Spade Husbandry*,) on the *lighter soils*, is of incalculable benefit. In the course of Flemish practice, a little fresh soil is added at each successive trenching, until the depth of two feet of mellow earth is obtained.

The work is best executed thus:—the labourer with a spade, the iron of which is about 15 inches long, and the handle 2 feet, digs out a furrow, say 3 feet wide, and then marks off with a line a parallel strip of the same width; he then digs or picks the surface, which he throws to the bottom of the first excavation, and proceeds to take a second, third, or fourth layer, according to the required depth. Standing in the last-formed trench, with his left hand at the bottom of the handle, and his right near the top, by the weight of his body, and without the assistance of the foot,* he sinks the spade about 18 inches, and, standing sideways, throws off the soil with a peculiar sleight and turn of the wrist, so as to lodge it in an *oblique* position in the trench, and against the preceding line of work, retiring as he casts it from the spade, and thereby effecting some little mixture of the strata, though the upper surface is at the same time placed below the other.†

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* Encyclopædia Britannica.

The sloping of the moved soil is quite essential, in order to the admixture of the strata, which otherwise would not be effected. The benefits arising from trenching are, the bringing into action a fresh surface, which, in porous land, must be more or less enriched by the deposition of manures which have penetrated downwards, the conversion of the weeds, &c. on the surface, into vegetable mould below, and —above all—pulverization, which allows to the roots of the plants a greater range for vigorous growth, and the abstraction of nourishment for the stalks through their agency, than the soil previously permitted.

Trenching dry soil evidently tends to render it less cohesive, and therefore drier, as the water descends to a greater depth from the surface.

Wherever trenching periodically takes place, fewer diggings or ploughings are necessary, and the quantity of manure is diminished, which advantages counterbalance the expense of the process.

The trenching-plough greatly facilitates this operation, but it can never so equally blend the different strata as the spade, from the oblique manner in which this places the layers in the trench.

TRIFOLIUM INCARNATUM — A species of clover. See *Clover*.

TURNIPS.—No vegetable—excepting clover—has had such influence in advancing the husbandry of Great Britain, as the turnip,‡ which was first introduced into Northumberland and the adjacent counties of Scotland (probably from Norfolk) as a *field* crop about 1780. The system of culture pursued in raising this invaluable root has been the means of rendering very inferior land highly productive; and, while it meliorates the texture of the soil, and prepares it in the best possible way for the succeeding crops of corn and clover, it has the extremely advantageous property of *producing* manure in large quantities, through the agency of stall-fed cattle, to a much greater extent than any other vegetable in general use.

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* This can only be in sandy or other very loose soil.

† Radcliff's Report of Flanders.

‡ It is a native of Great Britain, but in its wild state little, if at all, differing from the wild mustard plant.

The potato has had unquestionable influence in promoting the progress of population in Ireland, but assuredly it has not advanced the interests of practical agriculture to any great extent, because potatoes being generally appropriated to the supply of food for mankind, and also yielding a much lesser amount of bulk and weight than turnips, give little return to the soil, while they tend to its exhaustion far more than the latter, which derive so much of their nutriment from the atmosphere. On the eastern coast of Scotland, where modern husbandry has made the greatest progress, potatoes do not enter largely into the rotation; but in her western counties, where there is a dense population, as in Ireland, it is otherwise.

Even where potatoes used to be given as food for horses and cattle, the introduction of the Swedish and yellow turnip has superseded them in this respect. Potatoes cannot be substituted like the turnip for a summer's fallow, as there will not be sufficient length of season for the preparation, on account of the early period at which potatoes should be sown to ensure a productive return. The convenience of not being hurried at the busy time of spring to get in an important crop, is no trifling advantage. In truth, no one ever contributed more to the agricultural interests of our country than the individual who first cultivated turnips in the field.

There is a great proportion of the soil of Ireland excellent for turnip culture, and the humidity* of the climate is a very strong security against the ravages of the fly, which is so powerful an antagonist in Great Britain. Yet in Ireland turnips are in numerous large districts perfectly unknown as articles of local produce to the peasantry.

In the vicinity of bogs and mountains, where the means of raising ashes, in which turnips delight as a pabulum, are on the spot, they are never grown by a mere practical husbandman, though their culture does not necessarily interfere with the raising of the more essentially necessary potato crop.

Whence is this? Potatoes, wherever manure can be raised, are in the first case considered more *profitable*, from the demand for human food, in a country where the consumption of grain is so inconsiderable—secondly, from the mistaken notion that potatoes are more remunerative as food for cattle—and, thirdly, from the conviction that however extensively sown, they would be stolen as a dainty for the human *palate*.

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* In dry and rapid climates, turnips fail entirely in size. Even in the south of England they are inferior in weight to those in the north of Great Britain, and in Ireland.

The first and second objections require no discussion, and the third is of no weight. The petty depredations of women (perhaps to satisfy a longing) and of urchins cease, when the novelty of the crop wears off. The same objection once operated against the culture of turnips, and of beans too, in Great Britain. In parts* of Ireland at this moment, where beans are systematically and abundantly cultivated, the same complaint was made by the farmer on their first introduction, and similar difficulty would be at first experienced in those places where beans, as a field crop are now utterly unknown, and the (purely mental) association of boiled garden beans and bacon might lead to the mistake that raw tick beans must also supply excellent and delicate fare. Let turnips once become common in culture, and they will not be improperly meddled with, even in the most dishonest localities.† What has not turnip culture effected for England? What has not the same system wrought in *Scotland?* "No convulsion in the market prices could make the farmer forsake it," and the bare fallow is utterly exploded there.

There are several varieties; but all these are best classed under three heads specified by Professor Low, viz.

1. The round, commonly called the globe turnip.
2. The depressed, or Norfolk turnip.
3. The fusiform, or tankard-shaped.

No. 3 is the well-known and invaluable Swedish turnip, or *Ruta baga*. Of this class there are some varieties.

The Norfolk farmers have been long in the practice of raising No. 2, which was the first cultivated in their county, and is best suited to their light soils.

Turnips are also distinguished by "the white," "the yellow," and "the Swedish."

The oval, green, and white, and purple-topped, are very productive and early, and produced with very limited portions of manure. The species of this class grow large, and much above ground, and are fit for food to the beginning of February, when they become stringy and otherwise defective. They are at all times very inferior to the Swedish, in solidity and nutritive qualities, in the power of resisting frost, and of *keeping*.

The "stone turnip," which has a tap root, is close grained, sweet, and hardy, but inferior in size to the Swedish. The yellow Aberdeen, is a species between the Swedish and the globe, and sown in the season between the other two, and keeps longer than the "globe."

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* For example, the baronies of Forth and Bargie, in the county of Wexford, where a pod is never opened surreptitiously.

† The humorous hint of the English farmer, who put up a board with the inscription, "please steal in this quarter of the field," had its effect, and shews what well-tempered expostulation might produce any where, under similar difficulties.

Turnip-seed, like that of grain, requires frequent changing, else it will degenerate; and, as some seedsmen (by *mistake* of course) are very apt to mix old seeds with new, and to sell the worse for the better, it is prudent, in order to be sure of the kind, as well as the quality, which is not easily distinguishable, to transplant in an open situation, not infested by birds, (the land being well dug,) the different sorts required, *early* in spring. The tops should be cut within an inch of the bulb, and the turnips planted about a foot asunder.

The Swedish (designed for seed) will require to be staked, as the stalks grow very high, and may break down when coming into blossom unless supported. The stalks should be cut a few days before the seeds are ripe, and when hardened sufficiently for threshing, they are to be beaten out with sticks, from the husks, on a perfectly clean floor, or, still better, on a sheet.

If the plants are of different *kinds*, they should be carefully separated throughout the whole management.* The most appropriate soil for turnips, is sandy loam; but any dry soil will suit them. Tenacious clay or undrained moory soil is quite unfit for them, but a clayey soil, not too *strong*, if dry, is perhaps the best for the Swedish.

The most advantageous place in rotation, for turnips, is between two corn crops; but they are sown also with profit after early cut vetches.

Leys, ploughed early and deeply before winter, can easily be brought into very fine tilth for turnips, by two good ploughings and harrowings at the close of spring; but it is rarely desirable to break up ley in this way in the first instance, oats or wheat on one ploughing being decidedly more profitable.

Stubble land intended for turnips in the next year should be ploughed with a deep furrow in autumn, and at that time and subsequently in spring, treated precisely as if for potatoes, the only difference being as to the time of preparation, which is much later than for the latter crop, and that a finer degree of pulverization is required. This is absolutely necessary to the successful culture of this crop; if, therefore, the land be of a strong quality, and not reduced sufficiently in the season, by heavy harrowing and rolling, it must be ploughed and harrowed again and again, until it is in a fit state for sowing.

The necessity for a repetition of these labours must be determined by the nature of the soil, and its condition as to cleanliness. A single spring cross ploughing and harrowing, will suffice in a loose, sandy soil, (supposing the autumnal ploughing to have been good,) when on strong land much more labour is required.

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* See Irish Farmer's Calendar.

Turnips are in some parts of England still sown broad-cast, in defiance of all the experience and advice of those who really understand their culture, and who know that the way of insuring success is to have the seed nearly in contact with the manure; and this can only be done effectually by raised drills.* A correct estimate of the produce may be formed, when it is borne in mind that an imperial acre of land contains 43,560 square feet, and that if every foot produces a turnip of 2lbs. weight, the produce will be 46 tons per acre. A higher average could hardly be estimated when the plants stand so close, but the Swedish drilled have frequently produced 60 tons per acre, though a *much* lower rate of produce should be considered as probable and remunerative. In the words of Mr. Edward Carroll, "an open or porous soil being that best adapted for rough-leaved turnips, will, by such a crop being suffered to grow thick, possess the advantage which it stands so much in need of—namely, shade from a scorching sun, tending thereby to assist the secretions of the crop, and add to the vegetable staple of the soil."†

Some of Mr. Carroll's experiments furnish information as to the *seasons* of sowing the different kinds in a mild climate, as well as their proper successions and produce, and respective proportions of nutritive matter. He sowed as follows:—

			Gross Wt. per Statute Acre.	Produce of Nutritive Matter.	
			Tons.	Tons.	Cwt.
No. 1.	Green-topped Swedes,	Sown first week in May	32	2	1
„ 2.	Purple do. do.		35	2	7
„ 3.	Green-topped Aberdeen,	Sown first week in June	33	1	10
„ 4.	Purple do. do.		36	1	12
„ 5.	Do. do. Globular variety,		42	1	17
„ 6.	Dale's Hybrid,	Sown last week in June	32	1	12
„ 7.	Red and White Norfolk,		52	1	16
„ 8.	Common White Globe,	Sown first week in July	32	1	2

The Norfolk or globe turnip produces the largest weight, but it wants the solidity and nutritive matter of the Swedish kind, which is invaluable also for its property of retaining its highly nutritive properties to an advanced period of the spring, between the earlier kinds and the growth of the young grass, and may be transplanted to fill up vacancies from the middle of June to July. It is, however, raised on *inferior* soil, and with a much lesser allowance of manure, and therefore, has its own merits. Mr. Young considered, in his day, that 5 tons per acre was about the average quantity, broadcast; and, at this day, in England, 15 tons *broadcast* is considered a fair crop. Mr. Carroll's turnips were all *drilled*, and the neighbourhood of Dublin doubtless afforded him great facilities for manuring highly. From the Farmer's Magazine it appears that in Northumberland and Berwickshire a good crop of drilled globe turnips, yields from 25 to 30 tons, the Aberdeens and Swedish a few tons less, but that of late in Ayrshire 60 tons have been raised to the acre. We could obtain this quantity in most parts of Ireland, where the climate is singularly favorable for turnips.

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* Except when bone manure or any similar minutely divisible substance.

† Irish Farmer's Magazine, No. 68.

As to the mode of sowing in the broadcast way which has nothing to recommend it but the *shading* before referred to, it is only necessary that the sower should know how to scatter the seed evenly and expeditiously, unlike a seed-sower described by Mr. John M'Cormick, steward to the Earl of Charlemont, at Merino, near Dublin.

> "I inquired who was the seed-sower? when one of the men presented himself to me, and said that he was 'a first-rate hand,' and named two highly respectable gentlemen in the county, whom he said he sowed for before he came into Lord Charlemont's employment. Having given directions as to the quantity he should sow per acre, I watched his commencement very closely—which if one was in a merry mood, was really laughable indeed—to see him stride along carrying the motion of his hand as near the ground as he could reach, for fear, *it would appear*, the seed should be hurt by the fall, if he took a wide circular shake of the hand, and every five or six perches he went, he generally stopped to look behind him, took off his hat, with all the '*sang froid*' imaginable, placed it on the top of his head again, and then pulled up his breeches, and so proceeded for five or six other perches in length, when the same routine took place again. He took four times up and down to sow one ridge."*

All the effect of broadcast sowing can be attained by a drill machine, constructed for sowing at 12-inch intervals, which is more economical, and operates more regularly than the most experienced hand. As we by no means maintain the necessity of having *ridgelets* on sandy land requiring consolidation of surface and the uniform retention of moisture, and well adapted for sheep-folding—the narrow unraised drills, which are a close approximation to broadcast culture, may, in such circumstance of soil (and with a view to feeding off the crop on the field) be the best, on the supposition, however, that the manure is of such a nature as can be scattered by hand over the entire surface, or deposited with the drill implement. In the more common case of using farm-yard dung, more particularly on soil adapted to Swedes, we unhesitatingly assert the superiority of *drilling* at rather wide intervals. We shall therefore confine our observations to the drill culture.

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* Irish Farmer's Magazine, No. 67. This is evidently as much, if not more applicable, to the sower of grain.

The time for sowing varies according to the species, the Swedish requiring a longer time than the "globe," should be sown in the commencement of May; then come the intermediate yellow classes soon afterwards, and lastly, the white, until the close of June.[*]

Supposing the surface perfectly level, the drills should be opened from 27 inches to 24, according to the species of turnip, from centre to centre, as for beans or potatoes, but much shallower, to keep the dung as near the surface as possible, without actual exposure. The proximity of the seed to the manure is quite essential to the quick brairding of the plant, which affords it the best security from the ravages of the fly, to which we shall advert in due time.

Short, well-prepared manure, or compost from the *pie* is then to be forked into the drills by the dung-drag from the cart—the wheels of which move in two of the drills, while the horse walks in the intervening one—thus effecting the manuring in rows of three drills at each course. And here we may suggest a particular advantage, not noticed in the proper place, arising from the use of bone manure, or rape dust.

If the farmer has compost only for 15 acres, and requires manure for 20 acres, and can command crushed bones or rape-dust sufficient for 5 acres, let him combine the bone manure, &c. with his *other* manure, and he will then have an incorporated mass of fertilising matter for his 20 acres, far better than if he were to apply each of those manures separately.

To proceed. When the dung is deposited in the drills, the plough[†] should immediately cover it very lightly, and then the roller[‡] should be employed for the compression of the surface earth on the manure, and the exact levelling of the drills, before the drill harrow with a little roller attached to it for covering the seed, is put in motion.

If the land be adhesive at the time of this latter operation, some farmers affix a little rake to the roller, in order to prevent the surface from binding, and to facilitate the brairding of the plants, but this is only necessary under very peculiar circumstances, as a careful man will sow only at the critical time when the land is in a fit condition for rolling. But under all circumstances, the seed is to be sown as soon as the manure is covered, while it possesses its freshness and power of stimulating the seeds to a rapid growth in order to escape the very probable attacks of the fly. The seed, which, however, is not to be laid actually on the dung, but as near as can be without contact, should not be too much limited, lest the fly should visit it. The barrow drill is then set to work, drawn by a horse or pony, and the coulter kept steadily in the middle of the ridge, opens the little furrow into which the seed drops from the hopper.

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[*] Brush turnips are sometimes sown on stubble land without ploughing and without manure—late sowings yield little, but for sheep in the yeaning season, they afford a delicate bite.

[†] Ploughmen are usually averse to using the double mould-board plough for opening or covering drills, on account of the difficulty of directing it with precision and steadiness.

The heavier the better on sandy soil.

The next step is to hoe the plants when they have put out their second or rough leaves, and are about two inches high, as in cleaning potato-drills; and then to introduce the hand hoe, thinning out the plants to intervals of 8 or 9 inches. Mr. Carroll, our esteemed authority on many subjects, expresses himself most correctly on the principles and practice of hoeing. He remarks, (after stating his conviction from experience,) that the largest turnips are those which have two or three roots each, with the earth merely loosened between them, and stripped so as to leave about three-fourths of the turnip over the surface.

"On thinning the crop due regard must be had, first, to the kind of turnip; and, secondly, to the quality of the soil grown on. It is well known that Swedish turnips, when grown to a large size, produce a greater portion of nutriment than when had small—that is, weight for weight considered. 'Tis equally well known that rough-leaved turnips, of a large kind, weight for weight considered, are less nutritive than a crop consisting of smaller bulbs. If these notions be correct, it is not too much to say, that in thinning a crop of Swedes on good land, a foot to fifteen inches is not too great a space to leave between them. It will sometimes happen that two may be placed quite contiguous to each other, both of which are a tolerable size, whilst at a somewhat greater distance from either, are two much smaller ones; a question then arises whether it be better to remove one or both the large ones, for sake of the rule, than to leave both the large ones, though apparently too close, and remove the smaller. For my part I would feel no hesitation in removing the small ones, by which the larger will have the greater space to develope the resources likely to be attained and attainable at the common point of attraction, which it will be very evident had not been possessed by the smaller ones. Rough-leaved turnips, on the contrary, will require a different treatment. For, to ensure the greatest quantity of nutritive matter from such a crop, they should be let to stand so close as that they should not exceed in the size of their bulb, six to nine inches in diameter; it having been ascertained that a plant exceeding the latter dimensions is less nutritive than one that has not exceeded the former. As regards the quality of the land, it appears that nature in destining these two varieties of turnip, to be better adapted for two distinct varieties of soils, has also ordained that each soil will be respectively benefitted by that crop which it is calculated to grow to the greatest perfection, than by that of an opposite character: thus it is that Swedish turnips grown on a heavy soil, at considerable distances asunder, will admit of applying a superior tilth, together with a free action of atmospheric and solar influence on all the vacant spaces, thereby effecting all the good that could be expected from a naked fallow without being alloyed by any of its evils; whereas an open or porous soil, being that best adapted for rough-leaved

turnips, will, by such a crop being suffered to grow thick, possess those advantages which it stands so much in need of, namely, a shade from a scorching sun, tending thereby to assist the secretions of the crop, and add to the vegetable staple of the soil."

Three or four women will, in England, hoe an acre of turnips in the day.

In the course of ten days, or a fortnight, weeds will make their appearance again, and the horse and hand-hoeing must be repeated; if any plants had been passed over in the first hoeing, the errors can be now corrected; and when no more manual labour is necessary, the earth which had been taken away by the hoe should be laid up again in order to keep the ground dry during the winter, and to clear the intervals *perfectly* from weeds.

The storing of turnips in houses, or in heaps out of doors, like potatoes, is objectionable on account of the loss of nutritive juices, though under many circumstances* it may be necessary. Mr. Blaikie, of Holkham, and other practical men, have adopted the plan of carting turnips from the place where they grow to a convenient spot near the house, and before the severity of winter, and setting them, the tap-roots being cut off, on the surface of the ground, in an upright position, as close as they can stand. They keep better in this way, it is said, than stored in any other way. Swedish, which are little if at all affected by frost, are usually left in the fields where they grow, and are *drawn* only as required for use, taking care to have a supply always under cover for cattle, in case of such weather as would prevent carting to the sheds. (See *Cattle.*) The other kinds, which do not resist the influence of frost, nor keep well to an advanced period of spring, are best eaten (if on a large scale of sheep-farming) off the ground where they grow, in allotments, or separated by hurdles until the whole is consumed; or, in wet weather, when sheep should not be turned on them, either in the foldyard or a grass field.

The practice of consuming the crop on the place of its growth, is most beneficial on light *dry* soils which are deficient in the quality of cohesiveness, and equally the reverse on wet soils or any tenacious lands, except when perfectly dry.

For cow-keepers in large towns, and stall-feeding, all kinds of turnips must of course be drawn and taken to the byres, the fresher the better, and divested of their leaves and roots, which should be given to store-cattle alone, in the straw-yard or sheds.

A cheap and expeditious mode of lifting the crop is successfully practised by a Scotch steward.* He first shaves off the tops with a scythe; these he carts off for young cattle; he then ploughs out the bulbs with a one-horse plough, after which he introduces a single harrow, which turns them clean out of the ground. Two labourers throw the turnips into a cart, commencing to clear at the fore end, to prevent the bruising of any turnips by the wheels in their progress. Six persons will, in this way, lift an acre of turnips in a day.

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* For example, if the field be wanted for a particular crop, or if it be too tenacious of moisture for treading in winter.

Diseases and *Accidents.*—The greatest enemies of the turnip are the saw-fly,† and the grub. Whether these be the same insect in different stages of existence, or not, we do not presume to judge. The entomologist may satisfy his desire for investigating the subject by perusing an Essay, in the 36th Number of the Quarterly Journal of Agriculture, by Mr. Duncan, "on the Turnip Saw-fly."

According to this writer, the eggs of this fly are deposited in the leaves, where they are quickly hatched, "and the young larva generally finds its congenial food in the leaves on which its provident mother had placed it."

Mr. D. states in another place, "it is somewhat surprising, and a proof of the little attention paid to entomology in this country, till of late years, that although this insect has often appeared in great numbers, and done proportionate injury, it is only recently that it has been described in such a manner as to render it recognizable."

He describes the species (*Athalia Spinarum*) with minuteness, to distinguish it from others confounded with it, and conjectures that the flies which appear early in summer have probably outlived their abode in the pupal state under ground during winter, enveloped in their cocoon.

The females in spring lay their eggs in the leaves of the turnip, and the larvæ soon attack and devour their nests.

> "At first these larvæ are of a deep, black, colour, and of course small size; but they grow rapidly, and in the course of a few weeks attain their full dimensions. In the course of their growth they change their skin several times, and most of these moultings are attended with a slight change in the colour. After casting their last skin, they are of a dark-lead, or slate-grey colour, paler beneath, and having a light-coloured stripe along each side of the body just above the legs. Like most of the other larvæ of their tribe, when touched, or in any way disturbed, they coil themselves up and remain motionless."‡

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* Mr. William M'Intosh, steward to George Le Hunte, Esq. of Artramont, near Wexford.

† So designated "from the use and appearance of the instrument with which they deposit their eggs. It is placed at the extremity of the abdomen of the female, on the under side, and is so constructed that it combines the properties of a saw and auger."—*Mr. Duncan, on the Turnip Saw-fly, Quarterly Journal of Agriculture.*

‡ Quarterly Journal of Agriculture, No. 36.

> "When full-grown these larvæ (like all others known by the name of caterpillars[*]) cease to eat, and allow themselves to drop from the plant that nourished them, to the ground, in which they usually bury themselves, or they take shelter among rotten leaves, moss, &c."

Mr. Towers, the author of the Domestic Gardener's Manual, is of opinion that there are *three distinct species*, the *Haltica*, or fly-beetle, which preys for a short period upon the leaves or cotyledons, the *Tenthredo*, called the saw-fly, black fly, or "nigger," which attacks the full-grown leaves, and is the pest of the garden, and the *grub*,[†] the most destructive of all, which in the communication here referred to is stated to have been of no injury until 1836. This insect is described by this gentleman as of a greyish brown colour.

> "An inch or more long, with a caterpillar-like form, a brown or black head, six short, pointed claws, and eight flat, and short legs in two pairs, extending the length of the belly. The creature works under the surface, and whenever turned up to light coils itself into a curve, and lies on its side. It has a tough, glossy, skin, and its texture is firm and elastic as Indian rubber. The ravages begin when the turnips or Swedes become an inch broad; and every attacked bulb is gnawed into holes equal in size to the cells of a honey-comb. They continue during three months, but in October or November the grubs cease to feed, penetrate more deeply into the ground, remain torpid till spring, then change to the pupa, or chrysalis, and about June emerge in the perfect *Imago*, or fly state."[‡]

We cannot be expected, from any experience or researches, to decide between the conflicting *opinions* of naturalists on the qualities and supposed distinctions of the turnip-fly, when it is stated that the Doncaster Agricultural Society published a few years ago upwards of one hundred replies to the queries which they proposed for the purpose of eliciting information, and were yet unenlightened with any degree of precision, with respect to the natural history of the insect, or any specific mode of preventing its attacks. They conclude a valuable digest and report of the evidence, which is presented in a tabular form as follows:—

> "Waiting, as we must do, for further inquiries, which we hope may speedily bring to light the places and periods of transformation, we have already ascertained much that will be useful to the farmer, in the natural history of the insect. We have found that it is not altogether the creature of a few weeks, nor the inhabitant alone of the turnip-field, where only it is dreaded; that it not only lives through the summer, but survives the winter too, and waits only for the return of vegetation itself to return to its activity; that it continues in all fields, whether pasture

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[*] Mr. Duncan appears to consider the caterpillar identical with the saw-fly. He says, also, the larvæ are known by the names of black caterpillar, black nigger, canker, &c.

[†] These have been collected and measured by the *bushel!*

[‡] Irish Farmer's Magazine, No. 52.

or cropped, where weeds can be found to feed it; and that it only waits for the fragrance of the young turnip plant to leave every other vegetable, and commence its attack; that all rough grounds, and sheltered dry retreats, form a covert for it through the winter, and every tree is a hiding-place for the enemy; we have found too, that, however the process of preparation for turnips may accelerate the birth of the insect on the turnip-field, the fly is not dependent on any such process, but is brought into being and into abundance, independently of all cultivation. The farmer, knowing this, must therefore be on the alert against an enemy at hand, and in a thousand ways increasing around him. He will not be so much concerned in experiments for preventing the generation of the fly seeing that, in the present state of our information, it is almost out of his power to attempt it; but he will prepare against its ravages by such expedients as practical trial shall prove to him to be the most efficacious, even should they not be in all cases, and under all circumstances, completely successful.

"The committee conclude by giving the following few practical directions, drawn from the information it has gained:—

"1. That, most effectually to insure the speedy growth of the plant, the land should be kept in the best possible state of cultivation.

"2. That scuffling or ploughing the land before winter, and clearing the hedge bottoms, and every other place which can harbour the insect, should be systematically attended to.

"3. That the fallow should be completed as early as possible, so as to give an opportunity for choosing a favourable season for sowing.

"4. That the system of ridging the land, with manure under the rows, and drilling on the ridge, be in every possible case adopted.

"5. That the most favourable opportunity for ridging be chosen; particularly that the land be not ridged in too dry a state.

"6. That as soon as the land be opened for the manure, it be laid in—the ridges formed, and the seed drilled immediately. The quicker these operations follow each other, the better chance of the crop.

"7. That the manure chosen be such as will be adapted to the soil, and ensure the speediest growth of the young plant, and that a full quantity be allowed.

"8. That the seed be not deposited in the manure, but the manure be thinly covered with soil, and the seed drilled in this soil.

"9. That a very liberal allowance of seed be given, as much as three or four pounds per acre, for drill, and six or seven for broadcast, and that this seed be of one year's growth.

"10. That as soon as the plant appears above ground, it be dusted with quicklime, and this repeated as often as rain or wind beats it off and the fly re-appears.

"11. That in places which suit, and in seasons particularly dry, watering by a watering-machine be resorted to.

"Under these precautions, the committee confidently trust, that the loss of crop from the turnip-fly may be, in most cases, prevented."

In Berkshire, terrible devastation has been committed by the fly within the last two or three years; and in Buckinghamshire, within the same period, two bushel measures of grubs have been taken in two days from about the roots in *one* field. In Essex, the reports were equally dispiriting.

Mr. Coke, now Earl of Leicester, has lost in one year 200 acres of turnips, and other extensive agriculturists have lost in a corresponding degree; and it has frequently happened in England, that the same field, in the same season, has been sown three times for the chance of a crop.

But the remedies recommended in the practical directions of the Doncaster Agricultural Society cannot be considered as altogether efficacious, though probably preventive.

Fumigation is one of the best means of destroying the fly, and thus preventing one of the greatest calamities to which the farmer is liable, and this is the more easily done because it is in dry weather—most favourable to the process of burning furze, heath, straw, or any combustible substances upon the ground—that the fly infests the turnip-crop.

It will powerfully aid the above process, recommended by Sir John Sinclair, to burn *damp* straw, furze, &c. or *green* weeds, in heaps, at sufficient distances, and thus to fumigate the atmosphere, taking care to keep a sufficient supply of the damp fuel to sustain the smoke until the atmosphere is sufficiently filled with it. It is, however, necessary in this operation, that the heaps of fuel should be where there has been a failure of turnips—in case of broadcast culture—else the remedy will be as bad as the disease. In drill culture, there is no great difficulty, as the burning matter can be placed between the rows.

A correspondent of the Mark Lane Express proposes, on the first appearance of the turnip over ground, that the following mixture (calculated for two acres) should be strewed over it:—1 bushel of flour of brimstone; 1 bushel of sulphuret of lime (from a gas-house;) 6 bushels of dry sand.

In Evans and Ruffy's Farmer's Journal, there is a fully detailed mode of fumigating with brimstone, which it may be very useful to adopt.

"Let the farmer carefully watch his turnips as they come up, and whenever the fly makes its appearance, or rather when its ravages become visible on the rising crop, let him take a certain quantity of brimstone, according to the extent of the ground infested by the insect, about two-and-a-half or three pounds to the acre; let this be put into a kettle, and melted in the turnip-field, in a situation most eligible for the wind to carry the fumid matter over the ground, while the combustibles are in a state of preparation; take then a quantity of carpenter's shavings, brown paper, or any other combustible matter calculated to make a considerable smoke. These should be made up in small wisps or parcels, which, being dipped in the liquid brimstone, must be strewed all over the field in a state of ignition, and so close together that the fumes of the burning matter may completely cover every

> part of the ground. This work should be performed on a day when there is a gentle breeze, as a strong wind would blow off the smoke before it had the desired effect. After preparing combustibles sufficient for the ground to be fumigated, let the persons employed, carrying each a parcel of wisps, walk over the ground, lighting and throwing them down as they go, at the distance of four or five yards apart, till the whole is done. The quicker the operation is performed the better, that the whole may at once be enveloped in sulphur and smoke."

Watering from a barrel with *liquid manure* would stimulate the plants most effectually, and we think disgust the sensitive nerves of the fly more than any other application.

Sulphuric solutions sprinkled by machinery would also have a powerful effect. Or oil of Naptha, which preserves the sheep from the maggot-fly, would also, no doubt, banish the turnip-fly.

VEGETABLE PHYSIOLOGY—The science which relates to the organic economy of plants.

To the contemplative man no subject affords more scope for instructive amusement. The *religious* philosopher, in attentively viewing the wonders of vegetable life, whether he considers the functions and properties of those plants which are designed, by their peculiarities of structure, for duration through a long period of years, or for a single season, in tracing their successive stages from their first act of vegetation from the germ to maturity and decay, (under the mysterious and combined influences of light, heat, air, and moisture,) or, marking the suspension of existence through the "long sleep" of winter, "by which their vigour seems to be renovated, their worn-out clothing is cast off, and a new skin, new leaves, and new armature, fitted for their respective offices produced,"* is struck with admiration at the exquisite order and design observable throughout all their classes—genera and species—and feeling his own inadequacy to form a single stem, adores the omnipotence of *Him* who arrays the lilies of the field with a splendour which "Solomon in all his glory" could not equal.

VERMIN.—Of this class rats and mice are the principal plagues of the farmer. A whimsical and efficacious mode of destroying rats was communicated to the editor of the late Irish Farmer's Journal:—

> "Provide a cask of sufficient size, and place it upright in a room frequented by these pernicious vermin, and not much used by the family; nail several long boards round it, slanting from the top of the cask to the ground, and put flour, oatmeal, or any thing of which rats are fond, on these boards, and on the top of the cask; place fresh supplies every day, for ten days or a fortnight; the rats, thus accustomed to feed with security, will collect in great numbers; then knock out

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* Naismith's Elements of Agriculture.

the top of the cask, place a brick in it about the middle, and pour in water till it rises to the surface of the brick, but not so as to cover it; instead of putting the top of the cask on again, tie or nail on a large piece of parchment, sufficient to cover the mouth of the cask, in the middle of which cut several slits, and these several slits crossed by a single slit thus |—|—|—|—|. When this is done, you must scatter flour or oatmeal on the parchment and slanting boards as usual; at night, when the rats come to feed as before, and running up the boards, the first rat plunges headlong through the slit of parchment (which, by its elasticity, springs up again to its original position) into the water, and after swimming about a short time, finds the brick, which it gets upon directly, and begins to whine most piteously; another soon follows, and a combat ensues for the occupation of the brick; others follow, attracted by the noise, several battles commence, and the hideous screams of the wounded, alarm all the rats near the place, which rush to the fatal spot, and share the fate of their brethren. The catastrophe may be hastened by putting a live cat into the cask. By these means, all the rats in the neighbourhood may be destroyed, taking care to have a cask sufficiently large."

Those who prefer the poisoning system will find the following recipe efficacious for destroying both rats and mice:—

"Take one pound of fresh made flour, and drop into it six drops of the oil of thyme, six ditto of the oil of anniseed, seven ditto of carraway, and six ditto of rhodium.* Feed the vermin three or four times with the above mixture, then make the same quantity, in the same way, and mix into it three-fourths of an ounce of *arsenic* well pounded, and feed them in the same way."

Cats, though in some respects troublesome and disgusting, are necessary to keep "watch and ward" about the farmer's granaries, on which mice only commit depredations if those magazines of grain be on upper and boarded floors; and cats may be trained to extreme vigilance in the destruction of rats and mice.

VETCHES.—See *Tares.*

WAGGON.—This four-wheeled vehicle, so general a favourite in England, even for field-labour, as if for mere extravagant show, is very inferior in utility and effect to the one-horse Scotch cart. It has, however, on rough roads, and under certain circumstances, some advantages not obtained by the other. See *Draught.*

Railways being now so general for moss improvements, it may not be unacceptable to furnish a plate of a *small* waggon, (fig. 1,) with one length of straight railway, (fig. 2;) another piece, (fig. 3,) revolving upon a circle, when it is necessary to turn the waggon at an angle, to its former position, and a third (fig. 4) curved, and consisting of fixed rails, so as to form part of the course.

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* This is rarely obtained of genuine quality.

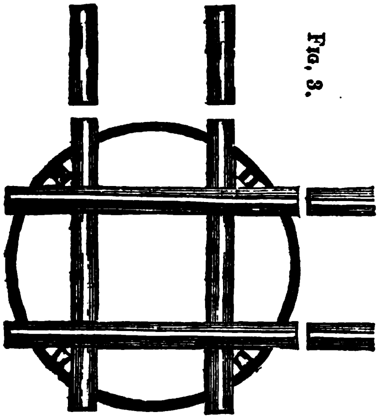


Fig. 3.

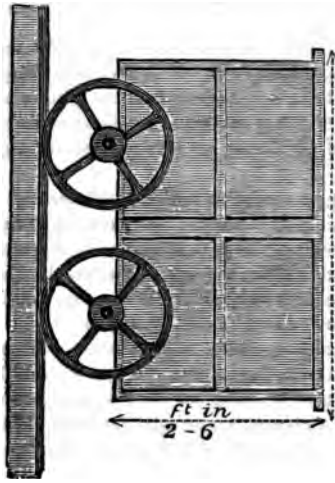


Fig. 1.

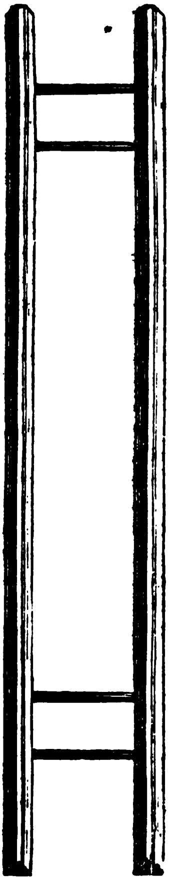
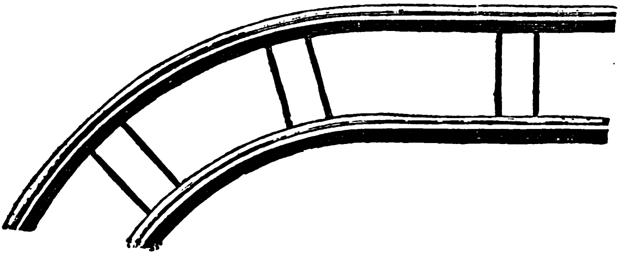


Fig. 2.

Fig. 4.



"In a stage of three miles and a half Sir Charles Stuart Menteath employs, at Closeburn, waggons weighing eighteen cwt. in which horses draw three tons. The road is in general upon a declivity of one foot of fall for every eight, sixteen, or eighteen feet, with several ascents of one foot in every thirty feet, up which a horse draws the load of three tons, and waggon of eighteen cwt.; but, in order to facilitate the ascent, a continuous line of sandstone rail-road is first laid down, upon which a plate of iron six inches wide, by a quarter of an inch thick, is fixed down upon it. Sir C. S. M. has known horses to draw three tons of iron up an ascent of one foot in fourteen for a short distance; and he is of opinion that when the pulls or ascents upon all the roads in this island shall be laid with a rail-road applicable to the wheels of common road carriages, that a horse will be enabled to draw the same load up the ascents that he can draw or work with upon the level parts of a road in a twenty-mile stage. In order to enable a horse to bring a load of three tons down any rate of descent, a friction-break has been employed, similar to the one in common use in Belgium, from which Sir C. S. M. derived this important application. The break is a strong plank fixed to the back of a cart or waggon, which, by means of a screw, the carter presses against the two hind wheels of the machine, so as to give a sufficiency of friction to retard the too rapid descent of the carriage.

"Railroads of cast iron, nine inches wide, somewhat concave, are laid down in the long ascent between the river Clyde, and the Forth and Clyde canal at Glasgow, which enables one horse, in a single-horse cart, to draw from two to three tons, though the rate of ascent in some parts of it is one foot of rise for every fourteen feet of distance. This plan of railroad for ascents has been adopted at Glasgow more than twenty years.

If the employment of one-horse waggons, weighing twelve or thirteen cwt. was adopted in conveying coal through the streets of London, one horse would do the work of two. At present four immense horses draw three chaldrons, or four tons one hundred weight of coal in a waggon weighing two tons, so that the shaft-horse is obliged to draw a weight of six tons in turning out of one street into another, which is the greatest cruelty a poor dumb animal can be subjected to.

"At the same time railroads of cast-iron, similar to those in use at Glasgow, should be laid down for the wheels of carts or waggons upon the narrow streets from the river Thames to the Strand, which would enable one horse to draw two tons up these streets, instead of employing six horses, according to the present practice for drawing four tons of coals upon the same streets in their present state."*

WEIGHTS AND MEASURES.—Although an act of parliament was passed in October, 1834, and came into operation in Ireland on the 1st of July, 1835, to abolish all merely local weights and measures, and to reduce them in some degree to a uniform standard, the object has by no means been sufficiently attained.

The stone, it is true, is now fixed at 14lbs., and the hundred at eight of these stones, and "all contracts made by any other stone, hundred, or ton, shall be null and void." Still the local prejudices and habits exist of giving 16lbs. to the stone of wool, and variable ounces to the pound of butter.

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* Obligingly communicated to us by Sir Charles Stuart Menteath.

A sufficiently accurate notion of the diversity which prevailed before the passing of this act may be formed from the following extract from the Companion to the British Almanack:—

> "The want of uniformity at present existing on this important subject is greater than we could have believed, until we saw it stated on the unquestionable authority of the Parliamentary Reports before us. This want of uniformity is found, not only between distant districts, but also between those which are contiguous. The boll, immemorially used in Scotland, is not an invariable quantity; that which is a boll in one county is not a boll in another, and even in the same county they sell wheat by one boll, oats by another, and meal by a third. The difference of the wheat boll in two contiguous counties is so great, that a person might buy a quantity of that grain in Haddington, and carrying it to Edinburgh, a distance of only sixteen miles, might sell it there at the same nominal price with a considerable profit. In Oxfordshire the Winchester bushel is universally used by the farmers; in Kent, they use the imperial measure. In Hampshire, according to one of the witnesses examined, (an extensive manufacturer of measures,) the farmers declare they will never use the imperial bushel, unless they are compelled to it. A whimsical instance of want of uniformity is mentioned by another witness, who tells the committee that a hundred weight of rope is 112 pounds, and a hundred weight of twine, in the same manufactory, is only 100 pounds. In the article of potatoes, three different quantities are delivered in London under the same denomination of weight, not one of which quantities agrees with that now to be established. In the markets of London 120 pounds are delivered for a hundred weight; when bought of the farmers 126 pounds are required; and when from ship-load, the buyer receives 132 pounds."

In some Irish counties the barrel of potatoes contains 20st.; in others 24. The barrel of oats contains 14st.; that of barley 16st. generally in Ireland; but in the county of Cork the barrel of oats has (or had) 33st. Potatoes are there sold by what is called *weight*—par excellence—21lbs.

In short, a stranger who had not his wits about him might, until the passing of this act, have been completely taken in from ignorance of local customs. Still he may, we apprehend, be deceived, and certainly puzzled in his calculations.

A select committee of the House of Commons, previously to the passing of the act affecting weights and measures, published a report, of which a portion is here submitted to the reader.

EXTRACTS FROM THE REPORT OF THE SELECT COMMITTEE.

"Perhaps, however, the inveteracy of ancient custom, so slowly broken in upon by new improvements, would better explain the continued existence of diversities that have no merit or use at this day. Whatever be the origin of these practices, the people have now no concern but with the evils.

"The principal evil is that which results from the use of contrary systems: for instance, corn may be bought in one place by weight, to be sold in another place by measure, which systems not being reducible into each other from the want of a common point of relation, it is impossible to determine at what rate such corn should be sold without the application of both of them combined, as will be hereafter shown.

"The same cause leads to constant disputes and misunderstandings, such as would occur in the commercial intercourse of men ignorant of each other's language. In the evidence of Mr. Roche is a remarkable letter from the Chamber of Commerce, at Limerick, illustrative of this fact.

"Owing to the dealings of different parts of the country being carried on by weight in one part, and by measure in another, it is sometimes thought necessary, in case of dispute, to weigh the whole, as well as to measure the whole of the cargo which was shipped. In consequence of this the labour of discharging the cargo is greatly increased.

"Of the evils produced by the diversities of the respective systems, the most general one is the occasional confusion experienced in the conduct of their business by persons whose skill does not enable them to calculate readily.

"But there are several other petty inconveniences which arise from the respective diversities of such systems. These inconveniences assume different forms, and give rise to different amounts of injury, according to the nature and frequency of the transactions in which the standards are required to be employed.

"There is, however, one evil of widely mischievous effect, which all the above-enumerated contrarieties and diversities combine to produce; the quotations in the public prints of the prices of corn in the different markets of the kingdom are thereby rendered unintelligible, and in a great degree useless.

"As the quotations are the only means within the reach of the farmer or small dealer of learning the state of markets, they become a matter of very general importance to that class of persons. The merchant and the large dealer having the benefit of extensive correspondence with persons engaged in the trade throughout the kingdom, do not so much require them. If the evil were confined to the mere exclusion of a part of the information which it is desirable that the farmer should have in order to regulate his transactions, less importance might be attached to it; but there is reason to apprehend, that in consequence of the imperfection in the quotations, the farmer is liable to be deprived of the fair market price for his produce, through the superior skill and information of the more experienced dealer. The farmer being only a grower, and his skill and attention being applied chiefly to cultivation, he has not in this matter the same facility as the dealer, whose skill and attention are almost exclusively directed to the turn of different markets. It is the business of the dealer to be well informed of the state of prices, but it forms a very small part of the business of the farmer.

"The quotations have been regarded as of importance merely for statistical or speculative purposes, but they are in fact of the highest importance in a practical point of view.

"It is requisite in all cases that the statement of the quotations should be intelligible, and the points of comparison exhibited in parallel, so that the calculations and inferences deducible from them may be readily obtained.

"The quantities should be expressed in the same terms. The price should be

> stated in the same terms; and if the variations of price arise from any other cause than the state of the market, that cause should be indicated.
>
> "Let these rules be applied to the commodity of corn, and it will be found that the quantities are expressed in different terms; that the statements of price also vary accordingly, and that the variations of price on account of difference of quality are not stated at all.
>
> "In short, none of the conditions of a good quotation are complied with under the present system.
>
> "Now, corn in its several species being beyond all other commodities indispensable to the subsistence of man, it governs the value of things in a higher degree than any other commodity. Wages, rent, and profits, are all to a great degree determined by it. It becomes necessary, therefore, that the information regarding it should be complete, accurate, and universal, so that all men throughout the country may refer to it as to one common standard of value."

The committee also strongly recommended a standard for the purchase of corn, combining the separate ingredients of weight and measure, which they calculated would afford a satisfactory and tangible test of both quantity and quality. The legislature has not however seen fit to act upon the suggestion.

The heaped Winchester bushel is abolished, and therefore the irregularity of weight or measure is so far corrected, but it is by no means, notwithstanding, a certain standard.

The English quarter of wheat contains 8 bushels; but by this rule of *measure*, and not of weight, the actual quantity of the quarter varies considerably.

According to the quality of the grain, the bushel may be said to contain from 56lbs. to 64lbs. Here is a great variation! Supposing the average weight of the bushel of wheat to be 60lbs. the quarter will weigh 480lbs.

The Irish barrel of *wheat*—for this is universally uniform throughout Ireland—of 20st. or 280lbs. is a fixed and intelligible quantity. But as it bears no very exact ratio to the English quarter, the merchant's calculations are sometimes a little complex. *If* the British quarter were invariably 480lbs. the Irish barrel would be to the quarter, precisely as 7 to 12.

In liquid measures there is also variation. The Scotch pint contains *about* (this *about* is the plague of the whole matter) two imperial quarts; and yet if a jolly Irish fellow goes to Edinburgh, and calls for a pint (*meaning* a Scotch pint) of whiskey, he gets about a mutchkin, and in no part of her Majesty's dominions does what is called a *quart** *bottle* contain much more than an honest pint.

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* It is grievous to think that Sir Boyle Roche's suggestions to the legislature, that "every quart bottle should be made to hold a quart," was not made a point of legislation.

The superficial measurement of land is as fast as possible becoming uniform, but it is desirable to have the statute acre universally the standard, for the sake of comparative calculations, which are confused by the distinctions.

On many estates* in Ireland, the statute acre has long been the measure of land; we hope that a uniform measurement will be general. If a farmer contracts for the making of ditches and drains at this day, by the perch, he has first to ascertain whether the measurement is to be 7 yards or 5½ yards to the perch; the latter being the *legal* measurement, he may be forced to pay labourers at a rate higher than he had intended, from having supposed that he was to have had 7 yards to the perch,† as formerly. These irregularities will, however, soon be corrected by general and uniform practice.

It may be useful here to state the superficial measurement contained in the statute, (or British,) the Cunningham, (or Scotch,) and the plantation, (or Irish,) acres, respectively.

The statute acre contains, - -	- 30¼	sq. yards.
The Cunningham - -	- 36	do.
The Plantation‡ - -	- 49	do.

By the following concise rule, the amount of each can be easily ascertained, in terms of the other two respectively. For example;—it is required to know how many statute are in 100 plantation acres: this is worked by the common rule of three;—in proportion as the statute acre is to the whole number of plantation acres; so is the plantation acre to the whole number of statute acres required. Thus, in the present instance, $30\frac{1}{4} : 100 :: 49 : x$. Whence we find the value of x, by multiplying the second and third numbers, and dividing by the first. In the same way the number of Cunningham acres in 100 plantation acres is easily determined by substituting 36 for 30¼ in the first term of the proportion.

WHEAT, (*Triticum*)—Is the most important, because the most nutritious and palatable of the cereal grasses. Linnæus comprehended all the different varieties in his day under six species; but modern botanists enumerate about thirty species, and some hundreds of sub-varieties brought into existence by continued cultivation.* For mere practical purposes it is sufficient to have two general classes—white and red—and the varieties distinguished by their spikelets—as the smooth, or bearded, the woody chaffed, or the hairy chaffed.

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* On those of the Duke of Devonshire, for instance.

† The (imperial) perch, the pole, and the rod, are all synonymous, and intended to express 16½ feet. A square statute acre contains 160 square perches, &c. The rood is the fourth part of an acre, and of course contains 40 perches, &c.

‡ The lineal measurement of British and Irish *miles* compared, is exactly in the ratio of 11 to 14; and the squares of these numbers give the superficial extent of British and Irish *acres* as well as of miles.

There are some varieties, characterised also as spring or winter (Lammas) wheats, though we have no doubt that the very same sub-variety indifferently bears both characters according to the season of sowing. There is, however, this undoubted distinction to be *acquired*, that the produce of seed sown in spring will have a tendency to *ripen* earlier than that of what is sown in winter. This, like all other grain, gradually accommodates its habits to the season; and *so far*, it may be entitled, after some generations, to the distinction of a spring wheat from this circumstance, though there is no marked difference in the appearance.

There are, however, *some* spring kinds which are distinguished in appearance and habits, and will not bear the severity of our northern countries in winter. The spikelets of those in general are more hairy than those of the red varieties; but the produce of all spring-sown wheat being on an average inferior in quantity and quality, the practice of sowing it has been gradually abandoned except in some of the southern districts of England. The inferiority of the spring sown wheat-crop, in grain and straw, probably arises from the grain being forced by the vernal sun too rapidly through its stages of vegetation, and ripening before the grain has been fully filled. Many instances have been stated of remarkable deficiency in the produce of wheat sown in March, when in the same field, and with similar treatment, that which had been sown in autumn yielded abundantly.

If naked fallow, from the baffling state of the weather, cannot be rendered fit for the reception of this grain in November, or early in December at farthest, it is far better to substitute barley in the ensuing spring.

Of the red kinds, "Hickling's prolific wheat" is a great favourite; the grain of this is short, and plump, and thin-skinned; the colour is a dark orange red, and *it is said* to yield double the produce of the common red Lammas; but all reports of the fruitfulness of this and other varieties should be received "with a grain of allowance."

The red variety just referred to, (unquestionably good,) was first raised by Mr. Hickling, in Norfolk, from three selected heads in 1830, and the multiplied produce in four years sowed eighteen acres of land. The Waterloo and Smoothey's are also great favourites on account of their fecundity. Among the most approved white varieties the Talavera and Whittington's prolific wheat (supposed by many to be identical) rank foremost; we can, ourselves, bear testimony to the great productiveness of Whittington's. The straw of this is remarkably tall, about six feet in height, and very strong; the head is long, thin, and flinty, and the produce in a favourable season, at least equal to Hickling's. Indeed it may be safely asserted that the white kinds are more prolific in a dry warm summer, and on good soil, and more valuable to the miller than the red varieties; but, on the other hand, the uncertainty of a favourable season, and the greater difficulty of harvesting the more delicate white grain, gives in our islands a decided superiority to the red, except in the midland counties of England, or such other districts as are not subject to the atmospheric humidity which prevails in the vicinity of the ocean, and in our more northern latitudes.

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* The probable reversion of wheat into grass has been gravely asserted; but this is too *wild* a hypothesis to bear the test of sober reasoning. Couch grass (triticum repens) bears, of all the grasses, the strongest resemblance to the wheat plant in some of its stages of vegetation; but surely no care nor culture will ever render this weed productive of grain. It is true that the finest fruits have been propagated by budding on the common crab stock; but this has no analogy to the other case. The roots of couch grass are taken up in Italy, and when washed, given to horses as nutritive food.

By an experiment made by Mr. Morton, of Chester Hill, near Stroud, and fully detailed by that gentleman in the Journal of the English Agricultural Society, it has been ascertained (as far as can be from a single experiment) that, out of sixteen varieties, the old red Lammas, and three other kinds of red wheat, have the property of tillering more than any of the others; and that the red Lammas wheat is the best.

The multiplication of wheat is very rapid by either of the following methods:—1. By selecting the grains of superior ears and dibbling them in a seedling bed, four inches apart every way. 2. By dividing and transplanting the roots.

By the first method, Colonel Le Couteur, of Jersey, an indefatigable experimentalist in wheat culture, produced four pounds nine ounces from one ear of a superior variety sown grain by grain, and allowed to tiller apart.

A remarkable instance of the multiplication of wheat in this way is recorded in the Encyclopædia Britannica.

> "On the 2nd of June, 1766, Mr. C. Miller saved some grains of the common red wheat; and on the 8th of August, a single plant was taken up and separated into 18 parts, and each part planted separately. These plants having pushed out several side shoots, by about the middle of September some of them were taken up and divided, and the rest of them between that time and the middle of October. This second division produced 67 plants. These plants remained through the winter, and another division of them made between the middle of March, and the 12th of April, produced 500 plants. They were then divided no further, but permitted to remain. The plants were in general stronger than any wheat in the

fields. Some of them produced upwards of 100 ears from a single root. Many of the ears measured seven inches in length, and contained between 60 and 70 grains.

"The whole number of ears which, by the process above mentioned, were produced from one grain of wheat, was 21,109, which yielded three pecks and three-quarters of clear corn, the weight of which was 47lb. 7 ounces; and from a calculation made by counting the number of grains in an ounce, the whole number of grains was about 576,840.

"By this account we find, that there was only one general division of the plants made in the spring. Had a second been made, Mr. Miller thinks the number of plants would have amounted to 2000 instead of 500, and the produce thereby much enlarged."

Transplanting in March or April in those parts of a wheat-field, whether in drill or broad-cast, where the seed or original plants failed, is unquestionably useful, provided the vacant spaces be first completely stirred up with a fork or hoe. This can only be done on a small scale, and more as a matter of interesting experiment than for practical purposes. A farmer cannot afford time or thought for such minute husbandry; it may, however, be practised most advantageously by the cottager who wishes to have a few stones of wheat for his cake, and in the model farms of agricultural schools, as well as by amateur farmers, who ought to be more or less experimenters.

Varieties are obtained by crossing two kinds in the blossoming season, and the attention of scientific men to this point is extremely important.

The soils suited to wheat are those of a clayey nature and heavy loam, especially so, if also calcareous; but after turnips, (if the cattle are fed on the field,) and clover, wheat is occasionally grown on light and even sandy soils, though these are evidently better adapted to barley.

Wheat is sown on naked fallows (manured) (see *Fallowing*,) or after manured fallow crops, such as potatoes, turnips, or beans, or on clover leys. The different modes of sowing, whether in drills or broad-cast, may be thus described:—If in drills, the ridges should be of such a corresponding breadth with that of the drill machine,† as to leave no surplus space after the turnings, two or more times according to the breadth of the ridge, which, for this grain, should not exceed twelve feet.

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* An ear of an *inferior* kind, under the same management, produced only one pound thirteen ounces.

† Cooks's improved drill machine is the best, and of most general application. The Norfolk drill is larger in its scale, and constructed to sow a breadth of nine feet at once. According to the breadth required between the rows, will be the number of drills sown by this machine, the hoppers of which should be moveable and easily adjusted, so as to have the rows at seven, nine, ten, or twelve inches apart.

The seed being deposited from the hoppers, is covered by a double or single turn of light harrows drawn lengthways. If there be no drill machine, a small, common plough, divested of its mouldboard, answers the purpose, and the seed may be sown broad-cast from the hand; the harrow moving lengthways, as in the other case, throws the earth which had been ribbed up by the plough back again, and covers the grain which comes up in parallel rows.

By the drill machine, the intervals between the rows of wheat can be easily made at nine inches, which is the *usual* distance—by the common implement, they cannot well be made narrower than twelve or fourteen inches; and this, besides the loss of horse-labour, is a serious objection to those who prefer the narrow drill. But many excellent farmers are of opinion that even a wider interval than twelve or fourteen inches is profitable, as this allows the horse-hoe to work effectually between the drills, admits of deeper pulverization, more horizontal expansion to the fibres, and greater tillering, besides affording more circulation of air.

Fallowing is, no doubt, the best preparation for wheat; but it is not an economical mode, and will not succeed without some animal manure or calcareous matter. If the soil be perfectly *drained*, or naturally absorbent, wheat will bear a great deal of severe weather in winter; nor will any frost materially injure it, particularly if it be protected by snow; but the cold winds in spring, when of long continuance, are more or less injurious, and the more so, if *rolling* be neglected.

The hand-hoe can be used freely between the rows at nine inches; it serves to cut away weeds, and is in some degree conducive to the tillering of the plants; but it does not cut deep enough to give that extension of movement which the horse-hoe affords to the fibres—we, therefore, on the whole, prefer twelve-inch rows and the small horse-hoe.

There is another mode of drilling wheat, which also answers for bean-sowing, namely, dropping the seed by hand, or by a single-rowed harrow, after the plough in each furrow. The succeeding furrow covers the seed, which comes up in rows of the breadth of the furrow slice.

There is a saving of at least one third of seed in favour of drilling, and probably a fourth more of produce is obtained if the work be perfectly executed.

We are tempted to describe a combined method of drilling and dibbling practised by Mr. Stringer, which was highly productive and remarkable for economy of seed.

"A six acre field, near Dublin, which had been under potatoes in drills, was harrowed and marked out into ridges of seventy feet. Nine drills were then marked out on each ridge with a tool like a garden-rake, the teeth of which were nine inches asunder. White Lammas seed was dropped singly at two and one half inches distant in the drills, and covered to the depth of four inches (from the furrows dug and shovelled.) When the plants appeared, the whole was rolled. The cost of dropping the seed was seventy-six shillings for the whole field; it might have been less, but Mr. S. humanely (and wisely, as he wished the business accurately done) paid an extra two pence per day to the women employed, and promised two shillings and six-pence to each, when the corn should appear at the prescribed distances. The gratuity was duly merited and paid. This field was sowed later and reaped earlier than any other in the neighbourhood: fourteen stone of seed served for the sowing of the whole. The ordinary allowance of seed for sowing the same extent of ground being ninety-six stone—the saving was consequently eighty-two stone, abundant compensation for the increased extent of sowing. Thirty-five stalks proceeded from every grain of seed, and fifty grains from each stalk. The produce was twenty-five barrels per acre, of a quantity so fine that it has been sold for seed at thirty-five shillings per barrel."

The saving of seed by this mode is considerable. One peck, instead of two or three bushels, which is the usual allowance per acre under the broad-cast method, in a national point of view, would be a consideration of vast importance; but the minuteness of this mode could not be rendered general, and it is only practicable on a small scale.

But in very stiff clay soils, and at the season of removing potatoes, the weather is often so moist, and the soil so adhesive as to render drilling difficult if not impracticable; and then the more expeditious broad-cast method must be resorted to. By this the seed is either *ploughed* under, in ridges on land in the fallow state, (as is generally the case in the best wheat counties in Ireland,) or harrowed in, *after* the ploughing, as is usual in England. The advantage in our judgment is greatly in favour of the Irish mode, which gives far better and deeper covering to the seed, and thus prevents the plants from being thrown out in the spring, as frequently happens after severe frost, and when the seed has been but imperfectly earthed by the harrow, and also allows a moulding to the plants in spring, if the ridges be then harrowed down (as they ought* to be) previous to heavy rolling, which is a most important operation. Wet land, harrowed down immediately after the sowing of wheat, frequently runs together, as it is termed, in the wetness of winter, and becomes partially bare. It is very common also in Ireland, to sow wheat broad-cast on ley, ploughed with as flat and thin a furrow as possible, and to cover the seed by means of the spade and shovel, from the furrows previously ploughed as deeply as possible for the purpose of yielding earth enough. The clover leys, as well as rich old pastures, are almost universally treated in this latter way for wheat (when this is the chosen crop) in Ireland. The best specimens of Irish agriculture are to be expected in the vicinity of Dublin; the practice there is to sow wheat, with few exceptions, *broad-cast*—probably the proportion of two thirds on clover leys, and the remainder on potato land, the fallow system being nearly exploded in the county Dublin. The style of ploughing has been so exceedingly improved in that district, as to increase the produce considerably, while the quantity of seed sown is diminished. The kind called *golden drop* is the favourite at present with the metropolitan farmers, who have been alarmed at some partial failures in Hickling's variety, (from its liability to knee,) although some of them have reaped from fifteen to nineteen barrels of it to the acre.

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* Unfortunately the common farmer in Ireland cannot be induced to use the harrow in spring; he fears that it would tear out the plants. Happy for him if it did so to the extent of at least one third!

Dibbling is another mode, which, though apparently very tedious and expensive, is partially practised in Norfolk, but only where the soil is dry and sandy. On ordinary wheat soils it is very unlikely to become a general system; the time lost in the process, the expense of labour, and the probability of inauspicious weather at a critical season, will always create a prejudice against a mode, which, under some peculiar circumstances, would unquestionably be remunerative, and which, to the small holder who merely cultivates a few roods of land, and who can employ his own family in the details of the process, will prove especially advantageous. The mode is thus described in Loudon's Encyclopædia of Agriculture:—

"*The dibbling of Wheat* is practised in some parts of Norfolk. The furrow is laid over flat, and a row of holes is made along the middle of each, by a man who uses a dibbler in each hand. A middling workman will make four holes in a second. One dibbler is sufficient for three droppers; whence, one man and three children are called a *set*. The dibbler carries on three flags or turned furrows; going on some yards upon one of the outside furrows, and returning upon the other, after which he takes the middle one; and thus keeps his three droppers constantly employed; and, at the same time, is in no danger of filling up the holes with his feet. The droppers put in two or three grains of wheat into each hole; but much time and patience are necessary to teach them to perform the business properly and quickly. An expert dibbler will hole half an acre in a day; though one-third of an acre is usually reckoned a good day's work. The seed is covered by means of a bush-harrow; and from one* bushel to six pecks is the usual quantity for an acre. Notwithstanding the advantages of saving seed, as well as some others which are generally reckoned undeniable, it is asserted by some very judicious farmers, that dibbling of wheat, on the whole, is not really a profitable practice. It is particularly said to be productive of weeds, unless dibbled very thick; which indeed may probably be the case, as the weeds are thus allowed a greater space to vegetate in. Marshall is of opinion that the dibbling of wheat appears to be peculiarly adapted to deep, rich soils, on which three or four pecks dibbled early may spread sufficiently for a full crop; whereas, light, weak, shallow soils, which have lain two or three years, and have become grassy, require an additional quantity of seed, and consequently an addition of labour, otherwise the plants are not able to reach each other, and the grasses of course find their way up between them, by which means the crop is injured, and the soil rendered foul. If a single grain of good size, and sound, could be dropt in each hole, and no more, there might be an advantage in dibbling, where it could be accomplished at a moderate rate; but where two or three grains are put in each hole, and often six or eight, the source of profit is diminished or destroyed by two-fold means; first, by using too much seed; and, secondly, because three or four grains springing out of one hole will not make such a strong plant or stool as one sound grain. The only way in which we can conceive dibbling likely to answer is, by the use of a machine such as that invented by Plunkett, but which never came into use. To attempt dibbling either wheat or beans by hand, on a large scale, we consider as quite unsuitable for the present improved state of agriculture."

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* A bushel of seed will furnish little more than a plant to every square foot; if the land, therefore, be not as rich and as well tilled as a garden, to fill up the land by vigorous and abundant tillering, this small quantity of seed will be insufficient. To tell the farmer, under any but very *peculiar* circumstances, that a bushel, or a bushel and a half of seed will be sufficient for an acre, will tend only to mislead him. Though enemies to *thick* sowing, we would avoid the opposite extreme.

Whether in rows or broad-cast, the horse-hoe or hand should be introduced once, in spring, and after the roller.

Thinning out the plants to proper distances, when broad-cast, greatly serves the general crop. This is an operation unknown in Ireland. If grass seeds are to be sown among the wheat, the hoe will be doubly serviceable, as it will afford cover to them, while it promotes the tillering of the wheat plants. Indeed, without complete harrowing and hoeing, wheat is the very worst crop with which to sow grass-seeds, from the consolidated state of the land, and the length of time during which weeds of all sorts have to germinate and possess themselves of the surface, especially if the wheat be in drills.

Under all circumstances, harrowing and rolling in the spring are necessary to break the crust and raise fresh mould to the stems, and to close the earth about them, whether it be too loose from the winter frosts, or in fissures from the transition to harsh, dry weather, after heavy rain, or rough, in which case the roller pulverizes the clods which the harrow had not broken, and renders them sources of support to the plants, instead of smothering them. Summer wheat, which is not sown until April, vegetates so rapidly, that it scarcely allows time for hoeing, or any other such treatment during its growth; nor does it require the same labour which is essential to the advancement of the winter wheat. Weeding in June is always indispensable, for then thistles and docks become very formidable, besides various other intruders which should be removed.

When the wheat is ripe (see *Harvesting*) it is universally cut with the sickle, and immediately bound in sheaves, and set up in *shocks* or *stooks* containing ten or twelve sheaves, with two of these placed in an inverted position, as a covering as well as ligament overhead.

After a few days (varying in number according to the state of ripeness in which the crop was cut, and the state of the weather) the stooks are fit to be removed to the stack-yard. In England they are never made into small field-stacks as in Ireland, where the irregularity of weather has led to the practice, but left out in the stooks until perfectly seasoned. Professor Low states that the practice in British agriculture with regard to the stooks of wheat, is to *omit* the head sheaves, as "in the case of wheat the stems are hard and dry, and require to stand only a few days before it is ready to be led home." He only allows caps for oats and barley, which require to stand a longer time in the fields.

The Irish farmer rarely omits to cover the standing sheaves with two or four inverted ones astride upon them, from which the rain trickles off as from thatch. Mr. Low judiciously suggests that "the shocks should be set nearly north and south."

The principal diseases of wheat are smut and mildew. Smut is either a coal-black dust, (called brand in some districts,) or of a brownish, greasy black, of a fetid quality, which is found in the grain, though appearing sound, and which is probably the malady properly distinguished by the name of canker.*

Mr. John Lawson is of opinion that smut begins as early as the formation of the ear of wheat; and to prove this assertion he describes in drawings the appearance of the smut-ball through all its stages. The interior of the flower is the part affected, and the disease does not usually appear until the ears are developed. This smut produces a shrinking abortion of the flower organs, and converts the peduncle into a powdery substance.

The cause, however, is a mystery, and naturalists have refuted and opposed each other, on every suggested opinion.

As the tendency in any particular crop of wheat to form smut-balls will very probably be continued through its produce, though there is probably no direct infection, it is obvious that no farmer should sow seed from a field in which this disease, or vicious structure of the parts of fructification has appeared.

Pickling the seed, and floating off the light and imperfect grains, is the best security for good and clean seed, and proves the best preventive of fungi (see *Fungi*) where there is reason to conclude that these are.

Mildew or *rust*, the plague of the wheat crop, is well known, and as old as the times of Moses. (Deut. xxviii. 22.) The ancient Romans* often complained of the *Rubigo* as an epidemic.

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* See Nos. 20, 37, and 42 of the Quarterly Journal; in which there are remarkably able and scientific essays on the diseases of wheat.

This malady affects the straw, and is decidedly occasioned by parasitical plants, (see *Fungi*,) which attack the crop under certain conditions, or quick transitions of temperature in the atmosphere, such as great heat after moist weather, when the plants are debilitated.

White wheat is more liable to this and the other diseases than red.

As the fungi may invade the crop, in various modes, it is impossible to prevent mildew by any treatment; but it is confidently asserted that *salt*, at the rate of five or six bushels to the acre, immediately after sowing, will generally prevent the ravages of fungi from the soil to the blade; and, as a proof of the efficacy of salt in this particular, reference is made to the experience of farmers living on the *skirt* of the sea-shore, where the soil contains more salt than in more inland places, whose wheat crops are said to escape; when, within three miles inland, the crops are as much affected as those still farther from the sea.† The effects of salt upon mildew are said to be astonishing in restoring straw attacked by fungi, to its original colour within forty-eight hours.

M. de Dombasle, a celebrated French chemist, and experimental agriculturist, has discovered the best kind of wash for wheat, as a preventive against smut, and probably mildew, viz. :—

"17lbs. 10oz. and 6dr. avoirdupois weight of sulphate of soda, or glauber salts, dissolved in 22 imperial gallons of pure water. As this salt does not dissolve very readily, it should be prepared the evening before use, and stirred frequently. The grain is to be formed in heaps on a floor, which are to be completely moistened with the above wash, by means of a watering-pan with a rose head. During the time the wash is being poured over the heaps of grain, they must be kept constantly stirred about by means of wooden shovels, till the whole be perfectly moist, which is known by the wash running from the heaps after they are sufficiently saturated. After the grain is well moistened, lime in powder is to be immediately thrown over the heaps, in the proportion of about 4lbs. 6oz. 9½drs., avoirdupois, to the 22 gallons, imperial, of grain; this is done gradually, while the grain is to be turned over in every direction, so that the whole may be intimately combined. When this is done, it may either be sown immediately, or kept for some days, in which case it may be turned over every three or four days. The quantity of lime mentioned does not require to be measured with great exactness each time it is used; it is sufficient to weigh the first time the quantity of lime which a suitable vessel may contain, to serve as a future guide. With regard to the lime, it is to be taken in the pieces as burnt, and slaked by a small quantity of water, and should be used as soon after it is reduced to powder as possible; but if one is obliged to keep it for some time, it should be placed in a cask, open at top, and covered with a cloth, over which should be an inch of dry sand or ashes; each time any of the lime is taken out, the above cover should be replaced."*

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* See Horace, Virgil, and Ovid.—Martin Doyle, Jun.

† Quarterly Journal of Agriculture, No. 42.

The practice of washing with pickle is certainly to be recommended as in some degree, at least, a preventive of disease and decay, but by no means a certain one. Atmospheric influences, on certain soils, or in particular aspects, are frequently productive of morbid tendencies in grain of every kind. Indeed this has been put to the test by Mr. Edward Carroll, in a very unerring way. That practical person sowed steeped seed-wheat in four different kinds of soils at the same time.

No. 1, on poor shingly soil.
No. 2, rich calcareous earth.
No. 3, loam, on the north side of the hill.
No. 4, cold clay.

Nos. 1 and 2 flowered nearly together, in dry, calm weather. In No. 1 there was neither smut nor mildew worth notice, and No. 2 was perfectly clean, and remarkably fine.

Nos. 3 and 4 were considerably later in flower, when the weather was *wet* and stormy, which was especially so when No. 3 was in flower, and both kinds were greatly affected with smut and mildew. In No. 3, he had not, to the best of his belief, a plant that was not infected. Wetness, and a sudden variation of temperature, at critical periods, will sometimes cause those maladies in spite of all precautions.

WHEELBARROW. See *Barrow.*

WHEELCARRIAGES. See *Cart* and *Draught.*

WHIN. See *Furze.*

WILLOW. See *Osier.*

WINNOWING MACHINE.—An implement for separating the chaff of corn from the grain, and cleaning it perfectly, by means of a strong current of air, produced by the rotatory motion of boards attached to an axle which passes through the machine, and is set in motion by a wheel acting upon a pinion. The best as to form is that of Meikle's construction, which has a set of sieves (instead of one screen) in motion together, by which the corn comes out from the hopper, after once passing through the machine in perfectly clean order for the market. Weir of London has improved this machine, probably to the utmost attainable point of utility and perfection.

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* Quarterly Journal of Agriculture, No. 42, p. 297, (*Journal des connaissances usuelles.*)

WORM.—The common earth-worm cannot be got rid of, and its frequent presence is an indication of rich land. Who would give any thing for soil in which this worm is not existing? But the wire worm, so common in old, stiff leys, and so destructive of the young stem of corn, which it cuts across just above the crown of the root, is a serious nuisance. This whitish or yellowish worm is about the tenth of an inch in diameter, jointed in the skin, and very tough, and remarkably tenacious of life. Various experiments have been made to destroy it. Lime has been applied in every possible way, but without success. Soot (dissolved in water) and salt have been the most effective remedies; in four hours a mixture of these killed some worms, when, in experiments with lime, others were not dead in less than forty-four hours. If salt be applied as a remedy, to a corn-field, it should be before the seed is sown, or at least before it germinates; about one ounce to a square yard is the best proportion. Soot, if diluted in water, may be used after the corn is up, and the ground may then be watered with it. The red worm lives longer in water, by twenty-four hours, than when exposed to the open air, but, in water, it dies within fifty-two hours.

WORMS IN HORSES. See *Horses.*

WORMS IN SHEEP. See *Sheep.*

THE END.

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